Volume 14, Issue 2, November 2019

Kesmas
National Public Health Journal

Quarterly Journal

Accredited (Second Grade, SINTA 2) by Ministry of Research, Technology and Higher Education of the Republic of Indonesia, the Decree No.30/E/KPT/2018 dated on October 24, 2018, valid year 2017 - 2021

Kesmas: National Public Health Journal Volume 14, Issue 2, November 2019

Kesmas
National Public Health Journal

Volume 14, Issue 2, November 2019

p-ISSN 1907-7505
e-ISSN 2460-0601

TABLE OF CONTENT

Accredited (Second Grade, SINTA 2) by Ministry of Research, Technology and Higher Education of the Republic of Indonesia, the Decree No.30/E/KPT/2018 dated on October 24, 2018, valid year 2017 - 2021

Kesmas
National Public Health Journal

Volume 14, Issue 2, November 2019

p-ISSN 1907-7505
e-ISSN 2460-0601

Kesmas: National Public Health Journal is a journal that contains both research articles and invited review articles in the field of public health and published quarterly

Published by
Faculty of Public Health Universitas Indonesia
G301 Building G 3rd Floor
Kampus Baru UI, Depok 16424
Mobile Phone: +62815-1141-6600
E-mail: jurnalkm@ui.ac.id or jurnalkesmas.ui@gmail.com
Website: http://journal.fkm.ui.ac.id/kesmas

Kesmas
National Public Health Journal

Volume 14, Issue 2, November 2019

p-ISSN 1907-7505
e-ISSN 2460-0601

Kesmas: National Public Health Journal is a journal that contains both research articles and invited review articles in the field of public health and published quarterly

Published by
Faculty of Public Health Universitas Indonesia
G301 Building G 3rd Floor
Kampus Baru UI, Depok 16424
Mobile Phone: +62815-1141-6600
E-mail: jurnalkm@ui.ac.id or jurnalkesmas.ui@gmail.com
Website: http://journal.fkm.ui.ac.id/kesmas

READER MAIL

Dear Editorial Team, Authors, Viewers, Subscribers, and Readers

As a student who studies environmental health, I feel very helped by the information i got from Kesmas: National Public Health Journal Volume 14 Issue 1 article titled "Hematological Indices of Pesticide Exposure on Rice Farmers in Southern Thailand". The article relates to the situation on field, because the main agricultural occupation in Asia is rice farming. I also have many family members working as farmers and most of them still use pesticide gradually without being aware of how it could affect their health. I hope this article will help raise awareness to the public and the government regarding the effect of pesticide towards our health, especially farmers exposed to pesticide on daily basis. I am looking forward to more environmental health related articles from Kesmas: National Public Health Journal. (Nur Arifin, Bandung)

INFORMATION

Kesmas: National Public Health Journal editorial team accepts any criticism, feedback and recommendation related to published articles and for the progress of journal that can be submitted through e-mail: jurnalkesmas.ui@gmail.com. Please kindly inform your name, institution name and address. We will publish criticism, feedback and recommendation received on reader mail in the next edition. We will provide an interesting souvenir for the reader whose criticism/feedback/recommendation is published on the reader mail. Thank you. **(Editorial Team)**

Since Volume 12 Number 1 August 2017, every article published is charged a manuscript handling fee amount IDR 750,000,- (seven hundred and fifty thousand rupiah)

Please make a bank transfer payment to:
UNIVERSITAS INDONESIA BHPP
Bank BNI UI Depok
Account No. 1273000568
Swift Code. BNINIDJA

Then please send the proof of payment to:
Secretariat of Kesmas: National Public Health Journal
Faculty of Public Health Universitas Indonesia
G301 Building G 3rd Floor
Kampus Baru UI, Depok 16424
or e-mail: jurnalkm@ui.ac.id or jurnalkesmas.ui@gmail.com

AUTHOR GUIDELINES

1. Kesmas: National Public Health Journal published articles in the field of public health that inclides Biostatistics, Epidemiology, Health Policy and Administration, Occupational Health and safety, Environmental Health, Health Education and Promotion, Public Health Nutrition and Sexual and Reproductive Health.
2. Submitted articles must be research articles and invited review articles that should not have been previously published or be currently under consideration for publication anywhere else and free plagiarism. Each submitted article will be checked by Ithenticate, an application for detecting plagiarism.
3. Components of Articles:
   - The title is written in English with a maximum of 20 words.
   - The author's identity is written under the title, which includes name, affiliation correspondence address, phone number and e-mail (only for correspondence author)
   - Abstract is written in English with a maximum of 200 words. The abstract should be one paragraph covering introduction, aim, method, results, and discussion as well as a maximum of 5 (five) keywords separated by comma.
   - Introduction contains background, brief and relevant literature review as well as the aim of study.
   - Method includes design, population, sample, data sources, techniques/instruments of data collection and data analysis procedure.
   - Result are research findings and should be dear and concise.
   - Discussion should properly and argumentatively define results of study with any relevant theory and prior finding.
   - Tables should be single-spaced and numbered consecutively in accordance with presentation in the text. Tables and/or figures should be no more than 6 (six) as presented in Result.
   - Conclusion and Recommendation should answer problems of study not exceeding the capacity of finding. Recommendation should refer to the aims and conclusion in form of narration, be logical and effective.
4. References should be prepared using Vancouver styles.
   - Reference number must be numbered consecutively in accordance with the whole text and current journal references are preferred.
   - Write the author's last name and first name initials maximum 6 (six) authors, the remaining should be followed by "et al".
   - The first letter of reference little should be capitalized and remaining should be written in lowercase letters, except name of person, place and time. Latin names should be written in italics. Title should not be underlined and written in bold.
   - Example of references:

   Individual Author Journal Article:

   Zainuddin AA. Kebijakan pengelolaan kualitas udara terkait transportasi di Provinsi DKI Jakarta. Kesmas: National Public Health Journal. 2010; 4 (6): 281-8.

   Journal Article Author Organization:

   Diabetes Prevention Program Research Group. Hypertension, insulin, and proinsulin in participants with impaired glucose tolerance. Hypertension. 2002; 40 (5): 679-86.

   Journal Article on the Internet:

   Abood S. Quality improvement initiative in nursing homes: the ANA acts in an advisory role. The American Journal of Nursing [serial on the Internet]. 2002 Jun [cited 2002 Aug 12]; 102 (6): [about 3 p.]. Available from:http://www.nursingworld.org/AJN/ 2002/june/Wawatch.htm.

   Books Written Individuals:

   Murray PR, Rosenthal KS, Kobayashi GS, Pfaller MA. Medical microbiology. 4th ed. St. Louis: Mosby; 2002.

   Book Written Organization and Publisher:

   Royal Adelaide Hospital; University of Adelaide, Department of Clinical Nursing. Compendium of nursing research and practice development, 1999-2000. Adelaide (Australia): Adelaide University; 2001.

   Chapter in Books:

   Meltzer PS, Kallioniemi A, Trent JM. Chromosome alterations in human solid tumors. In: Vogelstein B, Kinzler KW, editors. The genetic basis of human cancer. New York: McGraw-Hill; 2002. p. 93-113.

   Matter of Low or Regulation

   Regulated Health Professions Act, 1991, Stat. Of Ontario, 1991 Ch.18, as amended by 1993, Ch.37: office consolidation. Toronto: Queen's Printer for Ontario; 1994.

   CD-ROM:

   Anderson SC, Poulsen KB. Anderson's electronic atlas of hematology [CD-ROM]. Philadelphia: Lippincott Williams & Wilkins; 2002.

   Books on the Internet:

   Foley KM, Gelband H, editors. Improving palliative care for cancer [monograph on the Internet]. Washington: National Academy Press; 2001 [cited 2002 Jul 9]. Available from: http://www.nap.edu/books/0309074029/html/.

   Encyclopedia on the Internet:

   A.D.A.M. medical encyclopedia [Internet]. Atlanta: A.D.A.M., Inc.; c2005 [cited 2007 Mar 26]. Available from: http://www.nlm.nih.gov/medlineplus/encyclopedia.html.

   Website:

   Canadian Cancer Society [homepage on the Internet]. Toronto: The Society; 2006 [updated 2006 May 12; cited 2006 Oct 17]. Available from: http://www.cancer.ca/.
5. Manuscript should be typed using word processors (Microsoft Word or Open Office) software. The font used throughout the paper is Times New Roman. The paper size is A4 (i.e., 210 x 297 mm). Then it should be one-column format with all margin 3 cm, double spaced and maximum 5,000 words. Manuscript must be submitted via website http://journal.fkm.ui.ac.id/kesmas. Please include Covering Letter and Statements in a separated document file containing your summary of scientific finding and uploaded on Supplementary Files in PDF Format.
7. Manuscript published is charged a manuscript handling fee amount IDR 750,000,- (seven hundred and fifty thousand rupiah). Please make a bank transfer payment of charge to UI BHPP Bank BNI Kantor Cabang UI Depok Account No. 1273000568, then please send the proof of payment to e-mail: jurnalkm@ui.ac.id or jurnalkesmas.ui@gmail.com

Estuningsih *et al. Kesmas: National Public Health Journal*. 2019; 14 (2): 51-57
DOI: 10.21109/kesmas.v14i2.2257

Effect of Self-Regulated Learning for Improving Dietary Management and Quality of Life in Patients with Type-2 Diabetes Mellitus at Dr. Ramelan Naval Hospital, Surabaya, Indonesia

Yayuk Estuningsih[1], Thinni Nurul Rochmah[2*], Merryana Andriani[3], Trias Mahmudiono[3]

[1]Nutrition Units, Dr. Ramelan Naval Hospital, Surabaya, Indonesia, [2]Health Policy and Administration Department, Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia, [3]Nutrition Department, Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia

Abstract

Self-regulated learning is a process of learning how to manage and regulate oneself to obtain skills and knowledge without depending on others. It is expected that diabetes patients can manage their diabetes by themselves. This study aimed to analyze the effect of self-regulated learning-based educational intervention on quality of life for patients with type-2 diabetes mellitus (DM) at Dr. Ramelan Naval Hospital, Surabaya. This was a quasi-experimental study in the form of pretest and posttest with a control group design. A total of 20 patients with DM were randomly divided into intervention and control groups to undergo a 4-week intervention. The intervention group received dietary education with self-regulated learning, while the control group received standard education. The results revealed differences in variables such as dietary obedience, food intake at home, fasting blood sugar, diastolic blood pressure, and quality of life. The intervention group experienced a positive impact on the quality of life and resulted in better dietary obedience than that of the control group. In conclusion, the implementation of self-regulated learning-based dietary education can improve dietary obedience, knowledge, intention, family support, social support, physical activity, and quality of life for patients with type 2 diabetes.

Keywords: Diabetes mellitus, dietary obedience, quality of life, self-regulated learning

Introduction

Diabetes mellitus (DM) is a group of metabolic disorders characterized by hyperglycemia caused by the dysfunction of insulin secretion, insulin function, or both.[1] The prevalence of DM has been increasing in both developed and developing countries over the past few decades. The International Diabetes Federation,[2] has predicted a global increase in the number of people suffering from diabetes to a terrific 12 million by 2030, up from 7 million in 2009. The number of people with diabetes in the 20-79-year age group in Indonesia has been estimated as ranking seventh among other countries.[3] It is predicted that the prevalence of DM in Indonesia will double by 2030 compared to its prevalence in 2000.[2] In Surabaya, the second-largest city in Indonesia, the number of people with diabetes increased from 15,961 in 2010 to 21,268 in 2011.[4] DM ranked third of the major diseases among hospitalized people who were diagnosed between 2011 and 2013 at Dr. Ramelan Naval Hospital.[5]

Among people with diabetes, the chronic hyperglycemic condition can lead to defects and dysfunction of several body organs in the long term, especially the eyes, liver, nerves, heart, and blood vessels.[6] Therefore, any treatment for people with DM must be comprehensive to minimize negative effects. Treatment for DM must be comprised of namely four most important pillars of management: education, diet management, exercise, and medical treatment.[4] Diet management will be most successful if diabetes patients achieve some level of self-regulated learning. One of the primary factors in diabetes patients' behavioral change lies in internal factors like self-motivation.

Self-regulated learning works on the concept of

How to Cite: Estuningsih Y, Rochmah TN, Andriani M, Mahmudiono T. The effect of self-regulated learning for improving dietary management and quality of life in patients with type-2 diabetes mellitus at Dr. Ramelan Naval Hospital, Surabaya, Indonesia. Kesmas: National Public Health Journal. 2019; 14 (2): 51-57. (doi:10.21109/kesmas.v14i2.2257)

Correspondence: Thinni Nurul Rochmah, Health Policy and Administration Department, Faculty of Public Health, Universitas Airlangga, Surabaya 60115, Indonesia, E-mail: thinni_nurul@fkm.unair.ac.id, Phone: +62-812-3160-690*

Received : May 22nd 2018
Revised : September 21st 2018
Accepted : June 14th 2019

individuals learning to regulate their behavior.[7] Self-regulated learning describes the process of how an individual activates cognition, behavior, and his or her feelings systematically and how they are oriented toward achieving the goal.[7] A nutrition education intervention program provides self-regulated learning for people with diabetes in content areas; such as receiving relevant information, evaluating the information and comparing it with norms, triggering changes, searching for options, formulating a plan, implementing the plan, and assessing the effectiveness of the plan. The aim of this study was to analyze the effect of self-regulated learning-based education intervention in dietary management on quality of life for patients with type-2 DM who were hospitalized at Dr. Ramelan Naval Hospital.

Method

This was a quasi-experimental study with two groups of subjects and it was conducted in the forms of pretest and posttest with a control group design. The study population included all patients with diabetes who were hospitalized at Dr. Ramelan Naval Hospital, Surabaya, in April 2015. The participants were categorized into an intervention group and a control group. The inclusion criteria were patients diagnosed with type-2 DM with a minimum education level of junior high school, a minimum age of 20 years, who could read and perform activities independently, and who lived in Surabaya or Sidoarjo with their families. Patients with diabetes were those having who were excluded from the study complications of diabetic ulcers and gangrene; the patients with physical, mental, or cognitive disabilities or complications affecting food intake; and those not willing to participate.

The study sample was selected using the formula of hypothesis testing for two population means (two-sided test).[8] Referring to the formula, the total sample required for each group was 10 respondents. The respondents were randomly selected based on the inclusion criteria during the survey administered at the hospitalization units. Patients became participants after they understood the study protocol and filled out the informed consent (Figure 1). Each group consisted of 10 patients with diabetes.

In this study, quality of life was assessed from two aspects, namely, subjective and objective quality of life. The subjective quality of life was measured using the World Health Organization Quality of Life - BREF questionnaire, which included physical and mental health dimensions, as well as psychology, social, and environmental questions. The questionnaire was previously validated by Agnihotri *et al.*[9] Objective quality of life was measured based on blood sugar level, cholesterol level, systolic blood pressure, diastolic blood pressure, and body mass index (BMI) measurements. Another variable, dietary obedience, was assessed using a questionnaire consisting of the indicators of food waste at the hospital, food intake at the hospital, and food intake at home. To anticipate covariance variables such as the predisposing factor, the reinforcing factor, and the enabling factor, all the items were measured using the questionnaire. It consisted of nine questions addressing knowledge, belief, value, behavior, intention, family support, social support, pharmacology management, and physical activity management. All the question items in the questionnaire were validated ($r > 0.361$) and had good reliability (Cronbach's alpha ≥ 0.6).

The respondents were then grouped based on nutrition education to compare its effect on each group. In both the control and intervention groups, participants received standard medical care such as measurements of the blood sugar level, cholesterol level, systolic blood pressure, diastolic blood pressure, and BMI. Besides, they were identified by their predisposing, reinforcing, and enabling factors through the questionnaire to analyze the influence of each factor on dietary obedience and quality of life. The intervention group was exposed to nutritional consultation followed by intensive monitoring using the self-regulated learning approach. The control group received only nutritional consultation provided at Dr. Ramelan Naval Hospital and/or at home without further monitoring using the self-regulated learning approach. Participants in the control group were asked to collect data, including their daily food intake at the hospital and 1 × 24-hour recall during their stay as an inpatient at the hospital. After the control group had left the hospital, they were asked for data by

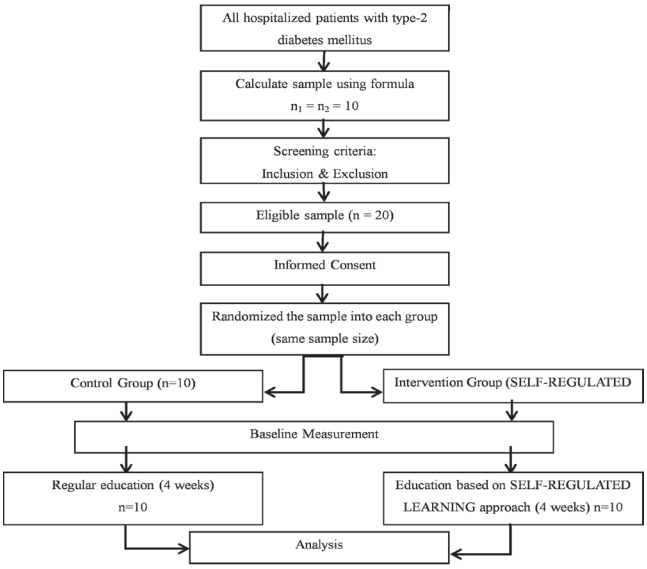


Figure 1. CONSORT Flow Diagram of the Study Sample and the Experimental Program

carried out for a period of four weeks.

Participants in the intervention group were queried in the same manner as the control group regarding food intake at the hospital with 1 × 24-hour recall and were provided self-regulated learning-based nutrition education for four weeks following the baseline measurements. The nutrition education was imparted in a stepwise manner based on self-regulated learning every week. In the first week, the educational intervention consisted of information related to DM (definition, diagnosis, and treatment) and diabetic diets (aims, principles, eligibility, and physical exercise). Strategies to accelerate change were also explained in the educational intervention session. In the second week, the educational intervention taught the respondents in the intervention group about how to search for options and formulate a plan. Regarding the details of how to search for options, the educator asked respondents to describe the obstacles they had encountered during the diet program; thereafter, the educator compromised and negotiated with the respondents, so that they would understand the objective of the educational intervention. In formulating a plan, the educator helped the participants plan the diet, which consisted of time targets, activities, a peer group to follow and supportive people to be around during the diet. In the third week of intervention, the educator taught the aspects of implementing a plan and assessing the plan's effectiveness. In the fourth week, the education on assessing the plan's effectiveness was repeated. Once the respondents left the hospital, the educational intervention was continued at their homes.

An independent t-test was used to analyze the difference between the control and intervention groups, a paired t-test was used to compare data before and after the intervention in each group, and a linear regression test was used to analyze the correlation and determine the factors affecting the dependent variables. All statistical tests were two-sided, and a p-value < 0.05 was considered statistically significant. Before the statistical analysis, the variables were examined for homogeneity using Levene's test. The result demonstrated that all the variables were homogeneous (p-value > 0.05) before the intervention, so that any difference in the posttest or after the intervention was attributable.

This study was carried out referring to the guidelines outlined in the Declaration of Helsinki. All the procedures involving human subjects and patients were approved by the Ethics Committee of the Faculty of Public Health, Universitas Airlangga, Indonesia. The ethical clearance No. 58-KEPK was issued on March 9, 2015. The approval for data collection was obtained from the Surabaya City Review Board and Dr. Ramelan Naval Hospital. Written informed consent was obtained from all participants before starting the study. The respondents were also informed that they could withdraw their participation in the study at any time without consequences.

Results

Most of the patients in each group were 40–59 years old (see Table 1). The control group had more female patients, while the intervention group had more males. Almost all the patients in the control group (80%) had been diagnosed with type-2 DM for more than five years. The DM duration for the control group was classified into category of more than five years, while for intervention group the majority was classified into a category of less than three years. All the patients in both groups had low levels of knowledge related to dietary education before the intervention.

Before the intervention program, both the control and intervention groups were assessed for baseline measurements to analyze homogeneity by the required independent t-test. As shown in Table 2, all the variables were homogeneous (p-value > 0.05); therefore, this study can assure that any difference in the posttest analysis is attributable to the educational intervention. On the other hand, this result ensured that both the control and intervention groups were similar before undergoing the intervention and the program.

The intervention group's blood glucose, systolic blood pressure, and cholesterol levels showed a greater decrease than those in the control group. However, BMI showed only few changes; the change in BMI was negative because both the intervention and control groups had an increased BMI after the intervention program. Regarding diastolic blood pressure, only the intervention group exhibited a change, with a decrease from pretest to posttest.

Table 3 shows the results of the linear regression test to determine the factors affecting dietary obedience. Among the predisposing factors, knowledge and intention affected dietary obedience (p-value < 0.05). Among the reinforcing factors, family support influenced the dietary obedience of patients with type-2 DM. Among

Table 1. Characteristics of Respondents

Category	Characteristic	Control Group		Intervention Group	
		n	%	n	%
Age	20–39 years	0	0	1	5
	40–59 years	6	60	11	55
	≥ 60 years	4	40	8	40
Sex	Male	3	30	8	80
	Female	7	70	2	20
Duration of diabetes mellitus	< 3 years	2	20	5	50
	3–5 years	0	0	2	20
	> 5 years	8	80	3	30
Knowledge level	High	0	0	0	0
	Low	10	100	10	100

Table 2. Homogeneity Test of Variables before Intervention

Factor	Control Group		Intervention Group		p-Value
	Mean	SD	Mean	SD	
Predisposing factors	67.5	7.12	66	9.78	0.699
Knowledge	9.1	2.51	7.8	2.74	0.284
Belief	13.2	1.76	12.7	1.77	0.533
Value	10.2	1.4	10.1	1.37	0.873
Attitude	19.8	2.66	19.3	2.54	0.672
Intention	15.2	3.04	16.1	3.5	0.546
Reinforcing factors	17.8	3.9	15.7	4.0	0.251
Family support	10.1	2.2	8.9	1.73	0.196
Social support	7.7	2.4	7.6	2.36	0.926
Enabling factors	18.6	2.32	18.6	3.17	1.000
Pharmacology management	11.1	1.1	10.3	1.4	0.176
Physical activity management	8.1	2.02	6.6	2.27	0.136
Dietary obedience	976.88	54.56	906.54	141.65	0.160
Food waste at hospital	602.8	335.71	566.27	275.8	0.793
Food intake at hospital	976.88	54.55	906.54	141.65	0.160
Quality of life	21.1	2.60	21.6	1.43	0.601
Subjective quality of life	111.9	11.08	108	15.99	0.324
Objective quality of life	12.4	2.27	13.2	1.03	0.758
Blood glucose level (mg/dL)	268.4	69.18	258.9	66.62	0.758
Body mass index (kg/m²)	21.57	3.73	24.27	4.47	0.160
Systolic blood pressure (mmHg)	141	8.76	141	8.76	1.000
Diastolic blood pressure (mmHg)	93	6.75	95	5.27	0.470
Cholesterol level (mg/dL)	325.3	52.65	323.3	33.79	0.917

Table 3. Effect of Predisposing, Reinforcing, and Enabling Factors on the Dietary Obedience of Patients with Diabetes in Both the Intervention and Control Groups at Dr. Ramelan Naval Hospital in 2015

Variable	Dietary Obedience	
	β	p-Value
Predisposing factors	0.522	0.000*
Knowledge	0.510	0.015*
Intention	0.453	0.001*
Value	0.253	0.108
Attitude	0.092	0.658
Belief	-0.051	0.681
Reinforcing factors	0.318	0.013*
Family support	0.442	0.035*
Social support	0.382	0.064*
Enabling factors	0.342	0.009*
Physical activity management	0.607	0.006*
Pharmacology management	0.222	0.261

Note: *Significant at α (alpha) = 5% based on multiple linear regression test.

intention affected dietary obedience (p-value < 0.05). Among the reinforcing factors, family support influenced the dietary obedience of patients with type-2 DM. Among the enabling factors, physical activity management was found to influence the dietary obedience of patients with diabetes. Variables that did not influence dietary obedience included values, attitude, belief, social support, and pharmacology management (p-value > 0.05).

As shown in Table 4, several variables were different between the control and intervention groups after the intervention, such as dietary obedience, food intake at home, fasting blood glucose, diastolic blood pressure, subjective quality of life, objective quality of life, and quality of life (p-value < 0.05). Several variables showed no difference (p-value > 0.05), including food waste at the hospital, food intake at the hospital, BMI, systolic blood pressure, and cholesterol level.

Table 5 shows several changes in all variables after the program in both the control and intervention groups. Compared with the control group, several variables increased in the intervention group, including food waste (change = -366.23), food intake (change = 879.25), dietary obedience (change = 1009.2), quality of life (change = 3.4), subjective quality of life (change = 18.6), and objective quality of life (change = 2.4).

Discussion

The results of this study agree with those reported by Dizaji *et al.*,[10] showing an improvement in the knowledge score of patients with diabetes after the implementation of an educational intervention program. Therefore, it can be concluded that there was a positive impact on the knowledge of patients with diabetes. Behavioral change was one of the most difficult steps in the educational process, despite providing educational intervention to people for three months.[10] A study by Skarbek,[11] also mentioned that family support would help people with type-2 DM increase their self-efficacy in self-managing actions. A study by Mayberry and Osborn mentioned that instrumental support was the most common form of family support.[12] Patients with diabetes got instrumental support from family members in areas such as diet, exercise, medication adherence, blood glucose monitoring, and managing doctors'

Table 4. Differences in the Characteristics of Respondents after the Self-Regulated Learning Approach-Based Dietary Educational Intervention at Dr. Ramelan Naval Hospital in 2015

Factor	Control Group		Intervention Group		p-Value
	Mean	SD	Mean	SD	
Food waste at the hospital	263.8	110.05	200.04	50.25	0.120
Food intake at the hospital	1551.22	337.58	1785.79	265.82	0.101
Food intake at home	1559.04	339.71	2225.68	262.93	0.000*
Dietary obedience	1555.13	238.65	2005.74	147.56	0.000*
Fasting glucose level (mg/dL)	170.6	36.69	129.9	21.7	0.007*
Body mass index (kg/m^2)	21.74	3.27	24.66	5.01	0.140
Systolic blood pressure (mmHg)	123	6.75	119	8.76	0.268
Diastolic blood pressure (mmHg)	93	4.83	87	6.75	0.035*
Cholesterol level (mg/dL)	266.8	39.9	260.30	41.3	0.725
Subjective quality of life	93.3	16.00	126.6	19.37	0.001*
Objective quality of life	13.0	2.16	15.6	2.07	0.013*
Quality of life	20.7	2.63	25.0	2.00	0.001*

Note: *Significant at α (alpha) = 5% based on independent t-test, SD = Standar Deviation.

Table 5. Changes during the Study Period (Pretest and Posttest)

Variable	Group	Mean Value		Change
		Pre	Post	
Food waste at hospital	Control	602.8	263.8	-339
	Intervention	566.27	200.04	-366.23
Food intake at hospital	Control	976.88	1551.22	574.34
	Intervention	906.54	1785.79	879.25
Dietary obedience	Control	976.88	1551.13	574.25
	Intervention	906.54	2005.74	1099.2
Subjective quality of life	Control	111.9	93.3	-18.6
	Intervention	108	126.6	18.6
Objective quality of life	Control	12.4	13	0.6
	Intervention	13.2	15.6	2.4
Quality of life	Control	21.1	20.7	-0.4
	Intervention	21.6	25	3.4
Blood glucose level	Control	268.4	170.6	-97.8
	Intervention	258.9	129.9	-129
Body mass index	Control	21.57	21.74	0.17
	Intervention	24.27	24.66	0.39
Systolic blood pressure	Control	141	123	-18
	Intervention	141	119	-22
Diastolic blood pressure	Control	93	93	0
	Intervention	95	87	-8
Cholesterol level	Control	325.3	266.8	-58.5
	Intervention	323.2	260.3	-63.2

appointments.[12] Furthermore, family support increased diabetes patients' capacity to choose appropriate foods according to their illness and condition.[12]

In managing their DM, patients must not only manage their diet appropriately but also their physical activity. Physical exercises should be performed continuously and regularly because the sensitivity of insulin receptors activated by the physical exercises does not last long. In addition, physical exercise has a weight loss benefit for obese and overweight people with diabetes. If managing diabetes mellitus through dietary regulation and physical activity does not succeed in maintaining normal blood glucose levels, then pharmacological therapy might be required. However, the most important intervention after pharmacological therapy is dietary management.

Self-efficacy plays a strong role in healthy eating and calories expended in physical activity, as does behavior-specific support from family, friends, and community resources.[13] As a predictor for a predisposing factor, intention evidently helps patients with diabetes achieve their goals and increase their self-efficacy.[14] Furthermore, having achievable goals can help patients realize their intentions.[14]

In the present study, after the respondents received the four week educational intervention, they changed their behavior toward dietary obedience. A study by Dizaji *et al.*,[10] demonstrated that the Precede Model provides an appropriate method of positive support in the educational intervention program through predisposing, reinforcing, and enabling factors after four weeks

of intervention. This result was consistent with a study by Borhani *et al.*,[15] that reported that the assessment of predisposing, reinforcing, and enabling factors in the educational process was highly effective toward behavioral change for self-treatment, especially for patients with diabetes mellitus.

Regarding the variable of dietary obedience, the present study used the indicators of food waste at the hospital, food intake at the hospital, and food intake at home, but only food intake at home had a difference. This might be because most of the respondents were unsatisfied with the taste of the meals served at the hospital. Moreover, the hospital did not accommodate their eating habits and preferred eating environments. Some obstacles were that the way the food was served was unattractive because of the limited utensils and the food tray. Patients' appetites also decreased because they were uncomfortable eating in the inpatient room. Regarding the food intake at home indicator, the intervention group showed an improvement in appetite due to the more comfortable psychological conditions and the fact that they completed their daily diet planning since receiving the nutrition education.

Diabetic education increased the positive health behaviors of patients with diabetes. These behaviors included healthy eating, physical exercise, and regular blood glucose control. These behavioral changes evidently had a positive effect on controlling blood glucose level.[16] People living with diabetes independently had higher self-confidence and self-management of diabetes than those who needed support.[16] Behavioral changes reduces the risk of complications, which affects quality of life.

The significant improvement observed in the quality of life aspects in this study indicated that the self-regulated learning-based educational intervention had an impact on quality of life for people with diabetes. As argued by Waspadji,[17] self-regulated learning-based educational intervention that provides knowledge and skills for people with diabetes is an attempt to create sustainability in behavioral change to improve an individual's ability to take care of their health independently, so that they can achieve a better of quality of life. Overall, this study is consistent with a study by Zareban *et al.*,[18] which indicated that people with diabetes who received educational intervention would have better obedience behavior than those who did not receive education.

One impact of behavioral change was to control blood glucose levels, which became an indicator of quality of life in this study. In the control group, diastolic blood pressure was still indicated by hypertension, unlike the intervention group, which had a mean value in the category of normal diastolic blood pressure. The United Kingdom Prospective Diabetes Study Group 38 reported a decline in the mean value of blood pressure compared to the no-strict diet group based on the effect of strict control of blood pressure for patients with diabetes.[19]

This study included only a small number of participants because of the difficulty and restriction of obtaining inclusion and exclusion criteria for the inpatient respondents. The representative distribution of population in this study cannot confirm the results of the statistical analysis since the sample size was not fully powered. The power test for sample size calculated using R with a minimal effect size by Cohen d = 0.2 gave a result of 0.07 or 7%, which had to be reported for the accountability of this study.[20]

A few limitations of this study deserve consideration. First, this study was related to dietary management based on self-regulated learning and considered an alternative to nutrition education for patients with DM to improve their health status. Second, the change in food intake at home was not analyzed during the study period (Table 5) since the respondents were admitted as inpatients at the hospital for the first week of the program. Therefore, there was no change during the pretest and posttest in the variable of food intake at home. To the best of our knowledge, this study might fill the void of evidence related to diabetes intervention in an Indonesian setting, which is a rarity in peer-reviewed journals.

Conclusion

This study demonstrated that self-regulated learning is effective in increasing the quality of life and the dietary obedience of people with DM and in decreasing the blood glucose level, diastolic blood pressure, systolic blood pressure, and cholesterol level. Furthermore, self-regulated learning for patients with diabetes can improve knowledge and change intentions, improving the need for family and social support and the intention to be physically active.

Acknowledgment

We acknowledge the contributions of Hanin Dhany Robby in translating and copy editing the manuscript. We would like to thank Dr. Ramelan Naval Hospital of Surabaya for facilitating the study.

References

1. American Diabetes Association. Standards of medical care in Diabetes 2010. Journal of Diabetes Care. 2010; 33(1): 11–61.
2. International Diabetes Federation. Panduan global untuk Diabetes Tipe 2. Brussels: International Diabetes Federation; 2010.
3. International Diabetes Federation. Diabetes estimates across the globe [Internet]. 2017 [cited 2018 Mar 18]. Available from: http://www.diabetesatlas.org/across-the-globe.html
4. Perkumpulan Endokrinologi Indonesia. Konsensus pengelolaan dan

pencegahan Diabetes Mellitus Tipe 2 di Indonesia. Jakarta: PB Perkeni; 2011.

5. Dr. Ramelan Naval Hospital. Medical record of Dr. Ramelan Naval Hospital Surabaya. Surabaya; 2014.
6. Rondhianto. Self-management education dalam discharge planning terhadap self-efficacy dan self-care behaviour pasien Diabetes Mellitus Tipe
2. Universitas Airlangga; 2014.
7. Schunk DH, Zimmerman BJ. Motivation and self-regulated learning: theory, research, and applications. New York: Taylor & Francis Group; 2012.
8. Levy PS, Lemeshow S. Sampling of populations: methods and application. 4th Edition. California: Wiley; 2013.
9. Agnihotri K, Awasthi S, Chandra H, Singh U, Thakur S. Validation of WHO QOL-BREF instrument in Indian adolescents. Indian J Pediatr. 2010; 77(4): 381–6.
10. Dizaji B, Taghdis M, Solhi M, Hoseini S, Mansou M, Shafieyan Z. Educational intervention based on precede model on self-care behaviours and control in patient with Type 2 Diabetes in 2012. J Diabetes Metab Disord. 2014; 13: 72.
11. Skarbek E. Psychosocial Predictors of self care behaviours in type 2 Diabetes Mellitus patient: analysis of social support, self-efficacy and depression. 2014; Available from: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.18.7072-1.pdf
12. Mayberry LS, Osborn CY. Family support, medication adherence, and glycemic control among adults with type 2 diabetes. Diabetes Care. 2012; 35(6): 1239–45.
13. King DK, Glasgow RE, Toobert DJ, Strycker LA, Estabrooks PA, Osuna D, et al. Self-efficacy, problem solving, and social-environmental support are associated with diabetes self-management behaviors. Diabetes Care. 2010; 33(4): 751–3.
14. Didarloo A, Shojaeizadeh D, Gharaaghaji Asl R, Habibzadeh H, Niknami S, Pourali R. Prediction of self-management behavior among Iranian women with type 2 diabetes: application of the theory of reasoned action along with self-efficacy (ETRA). Iran Red Crescent Med J. 2012; 14(2): 86–95.
15. Borhani M, Rastgarimehr B, Shafi Z, Mansourian M. Effects of predisposing, reinforcing and enabling factors on self-care behaviors of the patients with diabetes mellitus in the Minoodasht City, Iran. J Diabetes Metab Disord. 2015; 14(1): 27.
16. Prihantini, Hariyati DS, Dewi NS. Model diabetic educator dalam peningkatan perilaku kesehatan. Jurnal Terpadu Ilmu Kesehatan. 2012; 1(Mei 2012): 94–100.
17. Waspadji S. Diabetes mellitus: mekanisme dasar dan pengelolaannya yang rasional: penatalaksanaan Diabetes Mellitus terpadu. Jakarta: Badan Penerbit FKUI; 2013.
18. Zareban I, Niknami S, Hidarnia A, Rakhshani F, Shamsi M, Karimy M. Effective intervention of self-care on glycaemia control in patients with type 2 diabetes. Iran Red Crescent Med J. 2014; 16(12).
19. Njoto EN. Target tekanan darah pada Diabetes Melitus. 2014; 41(11): 864–6.
20. Cohen J. Statistical power analysis for the behavioral sciences. 2nd Edition. New York; 2013.

Simanjutak *et al. Kesmas: National Public Health Journal*. 2019; 14 (2): 58-64
DOI: 10.21109/kesmas.v14i2.2712

Maternal Knowledge, Attitude, and Practices about Traditional Food Feeding with Stunting and Wasting of Toddlers in Farmer Families

Betty Yosephin Simanjuntak[1*], Miratul Haya[1], Desri Suryani[1], Ali Khomsan[2], Che An Ahmad[3]

[1]Nutrition Department, Politeknik Kesehatan Kementerian Kesehatan Bengkulu, Indonesia, [2]Department of Community Nutrition, Faculty of Human Ecology, Bogor Agricultural University, Indonesia, [3]Faculty of Nursing Mahsa University, Kuala Lumpur, Malaysia

Abstract

Traditional foods are foods consumed by a certain ethnic group in a specific region. The habit of consuming traditional foods is usually inherited by the family members, including toddlers, of a respective generation. The study aimed to determine relationship of maternal knowledge, attitude, and practices in traditional food feeding with stunting and wasting of toddlers in the farmer families of the Central Bengkulu District. This study employed a cross-sectional design with a sample of mothers with children aged 12–59 months. The sample included a total of 115 farmer families. Data on nutritional knowledge, attitude, practices about traditional food, sex of children, and the number of family members were collected via interviews conducted with the mothers; stunting and wasting status data were collected via height and weight measurements. Data were analyzed bivariately using the chi-square test. Multivariate logistic regression analysis was also used in this study. It was found that there was a relationship between nutritional knowledge of traditional food and nutritional status of weight-for-age (p-value = 0.031), and there was a correlation between nutritional practices of traditional food and wasting incidence (p-value = 0.012). According to the height-for-age index, the nutritional status was related to the maternal knowledge of traditional food, whereas the maternal nutritional practice with traditional food had a significant relationship with the weight-for-age index.

Keywords: Knowledge, practice, stunting, traditional food, wasting

Introduction

Traditional food is formed as an evolutionary result of experiences that have been inherited for years, even centuries, and served in daily dishes consumed by families. The existence of traditional food is increasingly scarce owing to the complexity of the making of food and its limited knowledge by a certain group of people. Moreover, the main ingredients used in traditional foods are extremely likely to be determined by the location where they are found.[1] However, the tendency of consuming traditional foods in families is often during wedding ceremonies of the Bengkulu people. This tradition is still maintained and followed owing to their fondness, preference, and the ease to obtain the foods. Besides, as a coastal area, Bengkulu is rich in the diversity of typical fish food. This increases the wide usage of fish as the main ingredient of unique foods, especially in the coastal community. Dewi *et al.*,[1] reported that examples of tra-ditional fish-based food in Bengkulu are *Pendap, Pais, Lemea, Bagar hiu, Gulai kemba'ang,* and *Tempoyak* (fermented durian). These traditional foods have nutri-tional values and more specific tastes because the ingre-dients are obtained from local food sources, and the taste is relatively acceptable to the people of Bengkulu.

Failure of growth and development can affect an infant's life in adulthood. Nutritional status is a child development factor affected by eating habits. Healthy eating habits are mandatory for children who need to grow and solve acute dietary problems in children.[2] Furthermore, Sharif *et al.*,[3] stated that the process of transforming knowledge of the Malay traditional food among generations is from mothers to their daughters

How to Cite: Simanjutak BY, Haya M, Suryani D, Khomsan A, Ahmad CA. Maternal knowledge, attitude, and practices about traditional food feeding with stunting and wasting of toddlers in farmer families. Kesmas: Public Health Journal. 2019; 14 (2): 58-64. (doi:10.21109/kesmas.v14i2.2712)

Correspondence: Betty Yosephin Simanjuntak, Department of Nutrition, Poltekkes Kemenkes Bengkulu, Padang Harapan, Bengkulu, Indonesia, E-mail: patricknmom@yahoo.co.id, Phone: +62-736-341212*

Received : October 24th 2018
Revised : May 9th 2019
Accepted : July 15th 2019

with an explanation of the used ingredients, cooking methods, used equipment, and cooking skills. It is also assumed that mothers with a good nutritional knowledge prefer to prepare foods for their families. Another study found that attitude scores and maternal dietary understanding were positively associated with the toddler's diet scores.[4]

Most people in the Bengkulu Province still depend on the agricultural sector. Farmer families usually consume foods derived from the agricultural products. Therefore, research studies on the diversity of traditional food consumption in farmer families are still rarely carried out. The latest study by Oly-Alawuba and Iheidioha in Nigeria,[5] shows that stunting in children aged 2 - 5 years at 6.4% in the farming community. This is in contrast with the study by Cruz *et al.*,[6] which states that the children living in urban areas are significantly at a lower risk of stunting as compared with the children in rural areas, who belong the farmer families.[6]

Balanced nutrition is essential to maintain a good health and prevent malnutrition in infants, including stunting, wasting, and obesity. The anthropometric composite index is an anthropometric index that combines the three indexes, namely weight-for-age (WAZ), height-for-age (HAZ), and weight-for-height (WHZ), to determine the nutritional status of a toddler. A study in Bengkulu showed underweight toddlers at 11.9%, stunting at 28.09%, and wasting at 10.46% were mostly aged 13 - 59 months.[7]

Mothers are the first caregiver of toddlers in aim to mainly avoid nutritional problems in children and achieve an optimal growth. Maternal knowledge, attitudes, and practices affect the change of the children's diet. Mothers with a good knowledge will implement a good feeding practice; hence, their children will be free from malnutrition; in turn, this can help the children have a good health while following better dietary practices. Subsequently, this will help the mothers in changing their family's eating behavior and practices.[8] A study by Saaka,[9] concluded that there is a significant relation-ship between maternal knowledge and HAZ index, but it does not have a relationship with the WHZ index nutritional status. The aim of this study was to analyze the relationship of maternal nutritional knowledge and practices of traditional foods with the stunting and wasting of children (12 - 59 months) incidences in farming families in the Central Bengkulu District.

Method

This study applied a cross-sectional study design primarily in the Central Bengkulu District from April to July 2017, with a local ethical committee of Public Health Faculty, Diponegoro University No. 31/EC/FKM/2017. The population in this study mainly comprised all mothers in the agricultural areas who had children aged 12–59 months at Jambu, Renah Semanek and Pagar Jati subdistricts with a total of 137 people. The total number of mothers in the study sample was 115. Samples were selected using a purposive sampling technique. Exclusion criteria were non-farmer family heads and the children who were not able to stand upright.

The independent variables were maternal knowledge, attitudes, and practices related to the traditional food as collected by using a questionnaire consisting of 15 questions about definition, benefit, serving habits, role of traditional food for toddler. Knowledge was categorized into three categories including low (below 60%), medium (60% - 80%), and high (over 80%) of all correct answers. Nutritional attitudes were categorized into "disagree" with a score cut-off point of less than 80 and "agree" with a score of greater than 80. Practices are categorized into seldom and often.

The dependent variable was the nutritional status of toddlers that was measured based on the body length or height-for-age (Length/Age or Height/Age). Body mass was measured by using a digital scale, and the height was measured using microtoise. To assess the child's nutritional status, the weight and height of each toddler is converted into a standardized value (Z-score) by using the 2005 WHO anthropometric standards.[10] A total of 10 categories of the WAZ score included being underweight if the Z-score was between −3.0 and −2.0 standard deviations (SD), and normal if Z-score was between −2.0 and 2.0 SD. Categories of the HAZ scores included stunting if the Z-score was over -2.0 SD, and normal if the Z-score was below -2.0 SD. Categories of the WHZ scores included wasting if the Z-score was between -3.0 SD and -2.0 SD, and normal if the Z-score was between -2.0 SD and 2.0 SD.

Editing, coding, cleaning and entry data were employed on the collected data. Univariate data analysis included maternal knowledge, attitudes, and practices about the traditional food, nutritional status (WAZ, HAZ, and WHZ), sex of children, and the number of family. Inter-group comparison was performed with bivariate analysis by using the chi-square test. Multivariate logistic regression analysis was also carried out in this study. A p-value of less than 0.05 criterion was taken to determine the statistical significance.

Results

The data of 115 farming families, specifically mothers and their children, were analyzed in this study. Questions addressed to the mothers included their nutritional knowledge, attitude, and practices about the traditional food, sex of children, and the number of family members; whereas, the children samples were only measured for their body height and weight. Traditional foods examined

in this study consisted of snacks, side dishes, and vegetables. Traditional snacks often consumed were tart cakes, *Kembang goyang, Koja* sponge, and *Lemang tapai*. Types of side dishes were *Pais* fish, *Bagar* chicken, *Lemea* fish curry, and *Tempoyak ikan mungkus*. Vegetables consumed by toddlers were sweet and sour bamboo shoots, sweet cane egg curry, and stir-fried *pucuk lumai*.

Table 1 shows that out of 115 farming families, only 33.9% of mothers, who were working as farmers and housewives, have a high knowledge of traditional food. In terms of maternal attitude on traditional foods, most of the mothers (69.6%) showed the 'agree' attitude, but only 19.1% of them were practicing traditional foods often in their families. According to the Z-score, the WAZ index is categorized into two groups, namely underweight and normal. There are still 19.1% of toddlers with underweight nutritional status; whereas based on the HAZ index, 29.6% of the toddlers are stunted, and 11.3% of them have wasting based on the WHZ index.

Table 1. Distribution of Maternal Knowledge, Attitude, and Practices about Traditional Foods in Farmers

Variable	Category	n	%
Maternal knowledge of traditional food	Low	11	9.6
	Medium	65	56.6
	High	39	33.9
Maternal attitude to traditional food	Disagree	35	30.4
	Agree	80	69.6
Maternal practice about traditional food	Seldom	94	80.9
	Often	21	19.1
WAZ Index	Underweight	22	19.1
	Normal	93	80.9
HAZ Index	Stunting	34	29.6
	Normal	81	70.4
WHZ Index	Wasting	13	11.3
	Normal	102	88.7

Notes: n = the number of samples, % = percentage, WAZ = Weight-for-Age Z-score, HAZ = Height-for-Age Z-score, WHZ = Weight-for-Height Z-score

Table 2 describes the distribution of maternal knowledge on traditional food. In general, mothers know the meaning of traditional foods, that is useful, but there are still mothers (65.2%) who do not understand the danger of using coconut milk, and 60.0% do not know that traditional foods contain fiber.

As shown in Table 3, the five variables related to the WAZ index are maternal nutritional practices on traditional food (p-value = 0.012); whereas, the variables that have no significant association with the WAZ index are maternal knowledge and attitude about traditional food, sex of children, and the number of family members.

The results of chi-square test (Table 4) showed that

Table 2. Distribution of Maternal Knowledge Based on Correct Answers

Question	n	%
Definition of traditional food	109	94.8
Benefits of traditional food	109	94.8
The danger of using coconut milk in traditional food	75	65.2
Traditional food serving habits	105	91.3
Traditional food from fresh food	104	90.4
Traditional food are usually consumed only for adults	73	63.5
The important role of traditional food for the growth of toddlers	98	85.2
Nutrition in traditional food	105	91.3
Eating traditional foods causes diarrhea	77	67.0
Traditional food causes obesity	66	57.4
Fiber content in traditional food	69	60.0
Traditional food takes a long processing time	94	81.7
Traditional food contains a source of protein that is useful for children's intelligence	70	60.9
Traditional food in the form of snacks do not contain artificial dyes and preservatives	88	76.5
Traditional snacks can be filling	103	89.6

Table 3. Relationship between Maternal Knowledge, Attitudes, and Practices on Traditional Food with the Weight-for-Age Z-score Index

Variable	Category	WAZ Index				Total (n =115)	p-Value	OR (95% CI)
		Underweight (n = 22)		Normal (n = 93)				
		N	%	N	%			
Maternal knowledge of traditional food	Low	1	9.09	10	90.91	11	0.608	-
	Medium	14	21.54	51	78.46	65		
	High	7	17.95	32	82.05	39		
Maternal attitude to traditional food	Disagree	5	14.29	30	85.71	35	0.382	0.618 (0.208–1.833)
	Agree	17	21.25	63	78.75	80		
Maternal practices about traditional food	Seldom	1	4.76	20	95.24	21	0.012	4.308 (1.168–1.460)
	Often	22	23.40	72	76.60	94		
Sex of children	Male	13	20.63	50	79.37	63	0.073	2.143 (0.925–4.966)
	Female	9	17.31	43	82.69	52		
The number of family member	Big	14	16.28	72	83.72	86	0.287	0.510 (0.189–1.381)
	Small	8	27.59	21	72.41	29		

Notes: n = number of sample, OR = Odds Ratio, CI = Confidence Interval, WAZ = Weight-for-Age Z-score

Table 4. Relationship of Maternal Knowledge, Attitude, and Practices about Traditional Foods with the Height-for-Age Z-score Index

Variable	Category	HAZ Index				Total (n =115)	p-Value	OR (95% CI)
		Stunting (n = 34)		Normal (n = 81)				
		N	%	N	%			
Maternal knowledge of traditional foods	Low	7	63.64	4	36.36	11	0.031	-
	Medium	16	24.62	49	75.38	65		
	High	11	28.21	28	71.79	39		
Maternal attitude to traditional foods	Disagree	12	34.29	23	65.71	35	0.436	1.375 (0.568-3.229)
	Agree	22	27.50	58	72.50	80		
Maternal practices about traditional food	Seldom	5	23.81	16	76.19	21	0.523	0.700 (0.32-2.095)
	Often	29	30.85	65	69.15	94		
Sex of children	Male	23	36.51	40	63.49	63	0.112	2.143 (0.923-4.966)
	Female	11	21.15	41	78.85	52		
The number of family member	Big	19	23.46	62	76.54	81	0.663	0.735 (0.299-11.807)
	Small	10	29.41	24	70.59	34		

Notes: n = number of sample, OR = Odds Ratio, CI = Confidence Interval, HAZ = Height-for-Age Z-score

Table 5. Relationship of Maternal Knowledge, Attitude, and Practices on Traditional Foods with the Weight-for-Height Z-score Index

Variable	Category	WHZ Index				Total (n =115)	p-Value	OR (95% CI)
		Wasting (n = 13)		Normal (n = 102)				
		N	%	N	%			
Maternal knowledge of traditional food	Low	1	9.09	10	90.91	11	0.613	-
	Medium	9	13.85	56	86.15	65		
	High	3	7.69	36	92.31	39		
Maternal attitude to traditional foods	Disagree	2	5.71	33	94.29	35	0.201	0.380 (0.080–1.814)
	Agree	11	13.75	69	86.25	80		
Maternal practices about traditional food	Seldom	1	4.76	20	95.24	21	0.07	0.7 (0.234–2.095)
	Often	13	13.83	81	86.17	94		
Sex of children	Male	7	11.11	56	88.89	63	0.943	0.958 (0.301–3.05)
	Female	6	11.54	46	88.46	52		
The number of family member	Big	14	16.28	72	83.72	86	0.407	0.492 (0.147–1.647)
	Small	8	27.59	21	72.41	29		

Notes: WHZ = Weight-for-Height Z-score

Table 6. Final Variables of Multivariate Analysis

Anthropometric Index	Variable	p-Value	OR	95% CI	
				Lower	Upper
WAZ	Maternal nutritional practice	0.001	2.757	7.002	1.085
HAZ	Sex	0.040	2.143	4.966	0.925
WHZ	Maternal nutritional practice	0.045	3.071	9.593	1.018

Note: WAZ = Weight-for-Age Z-score, HAZ = Height-for-Age Z-score, WHZ = Weight-for-height Z-score

maternal nutritional knowledge (p-value = 0.031) was related to the HAZ index. Many of the mothers with a higher nutritional knowledge level were having children with a normal body weight. Due to the low maternal knowledge of traditional food, stunting was observed in 63.64% of the toddlers. There was no relationship between maternal attitude to traditional foods and the toddlers' HAZ index (p-value = 0.436). There were 34.29% mothers with 'disagree' attitude on traditional foods toward the HAZ index. There was no relationship between maternal practices about traditional foods and the toddlers' HAZ index (p-value = 0.523). There were rarely stunted toddlers (23.81%) among the 21 mothers, who showed practices on traditional foods. It was found that stunting was higher in boys (36.51%) than girls (21.15%). Based on the HAZ index, 23.6% of stunted children came from the families with the 'big' number of family members which did not show much difference from families with the 'small' family members (29.41%).

As shown in Table 5, all the variables (maternal nutritional knowledge, attitude, practices, sex of children, and the number of family members) are not related to the WHZ index. Most of mothers with low knowledge had normal WHZ index at 90.91%. Mothers with 'disagree' attitude (94.29%) on the traditional food had children with the normal (WHZ) index. In this study,

mothers with "seldom" nutritional practices had 95.24% were normal.

Table 6 shows that the p-value of the WAZ index was 0.001 (p-value < 0.05 with OR = 2.757) and WHZ was 0.045 (p-value < 0.05 with OR = 3.071). It means that mothers who seldom practiced traditional food feeding to their children had 2.757 times higher risk of having underweight (WAZ) index than mothers who often did. In the WHZ index, the mothers who seldom practice traditional food feeding to their children had 3.071 times higher risk of having wasting (WHZ) index as compared with the mothers who often did.

Discussion

This study showed that the HAZ index was influenced by nutritional knowledge (p-value = 0.031), and maternal nutritional practices were related to the WAZ index (p-value = 0.012). Also, this study found no relationship of maternal knowledge, attitude, and practices with the WAZ index. This is likely due to other factors. Several factors influencing the nutritional status included sex, the number of family members, income, father's education, family income, education, and maternal employment.[6] Galgamuwa *et al.*,[11] stated that being underweight is more common in the low-income households than in the high-income households. It is similar to a study in India showing that children from low-income group have a high level of unaffordability to buy foods. It shows that poverty is not the only factor responsible for malnutrition but inadequate food intake, poor hygienic habits, and environment along with low education level also can contribute to child malnutrition among the low-income groups.[11]

This study showed that the WHZ-based nutritional status of farmer families was not influenced by nutritional knowledge and attitude, but influenced by nutritional practices. There was a relationship between maternal understanding of dietary and WAZ (p-value = 0.031). Saaka,[9] stated that an increase in maternal child care knowledge may contribute significantly to the child's nutritional status in Ghana. In another study, the score of maternal nutritional attitude and knowledge was positively related to the child's diet score.[12] Maternal knowledge was not only obtained from the level of education, but also received from mass media such as television. Stunting, caused by experiences of chronic nutritional deprivation, affects approximately 25% of child under-five. There is a relationship between stunting and child development in the low- and middle-income countries.[13] It is estimated that the level of expertise of maternal nutrition can be useful for feeding toddlers, so that the nutritional status of children is normal. Previous studies have demonstrated a significant influence between maternal knowledge and children's nutritional status.[14] In line with the study by Alawuba,[5] there was a relationship of knowledge of nutritional education with the WHZ (p-value = 0.018), HAZ (p-value = 0.012), WAZ indexes (p-value = 0.026).

This study showed that there was a relationship of maternal nutritional practices with the WAZ index (p-value = 0.012). It can be seen that most mothers with a high level of nutritional knowledge could practice how to supply their food, so that their nutritional needs are fulfilled. In line with the study by Yabanci *et al.*,[4] finding that many mothers have higher levels of nutritional practices and their children have normal weights. The study by Saaka,[9] showed that maternal knowledge is correlated with HAZ, but not with WHZ index. The nutritional knowledge of traditional foods will affect mothers' ability to provide both in terms of quantity and quality to affect the food consumed by children.[9] The variety of food ingredients in the family will increase the intakes of energy and other nutrients. The study by Adnan and Muniandy,[15] found that the maternal know -ledge level influences the practice of feeding children and, ultimately, determines the nutritional status of children. Maternal nutritional knowledge has an im -portant role in improving the nutritional status of their children. Mothers who provide the proper nutritious food can help the children meet the needs for a better growth and nutritional status.[16]

The most common problem of malnutrition in toddlers is stunting. Stunting is a major public health problem in developing countries such as Indonesia as compared with underweight and wasting. The HAZ-based nutritional status showed stunting to be prevalent in 6.1% of the toddlers.[2] Stunting is resulted from a complex interaction of household, environmental, socio-economic, and cultural influences that are described in the WHO Conceptual Framework on Childhood Stunting.[17] This study is almost the same with the study by Alawuba in Nigeria,[5] which found that stunting in children aged 2-5 years is 6.4%. However, a study on fisherman families in the Philippines found 30.3% stunting incidence in children aged 0–60 months,[18] which is in contrast to the study by Cruz *et al.*,[6] stating that children living in urban area have a significantly lower risk of stunting than children in rural areas, with a p-value < 0.001. A study by Sarma *et al.*,[19] showed that the prevalence of stunting was found at around 41% among children under 60 months of age, and higher in rural area than in urban area (43% versus 36%).

Traditional food is a cultural phenomenon as they are consumed by a certain ethnic group in a specific region. Traditional foods have the potential to be a source of nutrients that is sustainable, economically, culturally acceptable and diverse, but not yet continuously used to prevent malnutrition through the diversification of tradi-

tional food-based foods.[3] In fact, the traditional source of food can be used for elevating the strategy of improving the nutrition for family with a traditional food base. Micronutrients in forms of iron, vitamin A, and vitamin C are mostly available in traditional foods.[20] Besides, an optimization of the use of local food means that it is easily obtained and the price is relatively affordable.[4,8]

Lifestyle and dietary changes lead to the increased occurrence of obesity and chronic diseases. The rapid nutrition transition in this region may be due, instead, to the increasing food availability and food purchasing po wer, rather than to a shift in food preferences toward modern Western foods.[21] As a result, the micronutrient intake becomes low. Another consequence is the increase in energy, carbohydrate, and fat consumption.

Results of this study highlighted that traditional foods in Central Bengkulu included vegetable groups with traditional food ingredients mostly obtained from rice fields such as *unji, lumai, kambas, lemea, umbut*, round purple eggplant, ferns, white mushrooms, taro leaves, and young papaya.[1] The vegetable is processed by sauteing or making chili sauce. Vegetable food ingredients which are usually processed into the sauce are *unji*, young papaya, *lumai* fruit, and *lemea*. By judging from these types of traditional foods, mothers usually only provided vegetable soup to their toddlers, or serve it in a small size. Traditional foods in the study location rarely used fish because the site of this study is located in an agricultural area, so that the source of the animal protein generally comes from the livestock they produce, including eggs or fish they buy in the market.

Based on the analysis results, the WHZ-based nutritional status in wasting category was at 11.3%. This figure shows that the prevalence of nutritional status of very thin toddlers is higher as compared with the study by Olack *et al.*,[22] in Kenya at 0.6%. Capanzana *et al.*,[18] showed the prevalence of wasting in children aged 0–60 months in the Philippines at 7.9% and the prevalence of overweight at 5.0%. Also, a study by Derso *et al.*,[23] stated that prevalence of stunting and wasting in children aged 6–24 months in Ethiopia are 58.1% and 17.0% respectively. Wasting is found correlated with the sex of the child, but not correlated with the households headed by fishermen and farmers.[23] However, multivariate test in this study indicated that stunting was correlated with sex (Table 6).

A previous study revealed that traditional foods contributed by 30%–40% of the average daily energy of toddlers. Traditional foods contain a lot of sources of protein, iron, and vitamin A. Traditional foods are useful for maintaining adequate body intake.[5] However, the fact shows that there is a change in feeding in family. The decline in the contribution of traditional food gradually over this century due to the knowledge of traditional foods is low, so that the available local nutrient sources are not used optimally. The loss of traditional food consumption will lead to a decrease in the diversity of diet in each tribe, and a changing lifestyle causes people to choose to buy fast food.[5]

Conclusion

There is a relationship of maternal nutritional practices with the nutritional status of toddlers (12–59 months) based on the WAZ and WHZ indexes in farmer families in the Central Bengkulu District. While, the sex of children has a substantial relationship with the HAZ index, it is necessary to improve the maternal understanding of traditional food, so that the mothers of the toddlers can practice the feeding in order to improve the child's nutritional status. The traditional source of food can be used for elevating the strategy of improving the nutrition for family with a traditional food base. Micronutrients including iron, vitamin A, and vitamin C are mostly available in traditional foods. On the other hand, an optimization of local food means that it is easily obtained and the price is relatively affordable.

Acknowledgment

The authors would like to thank the Neys-van Hoogstraten Foundation for funding this study. Appreciation is addressed to the Director of Health Polytechnic of Bengkulu, the Dean of Faculty of Human Ecology, Bogor Agricultural University.

References

1. Dewi KH, Silsia D, Susanti L. Bengkulu industry mapping of "Lemea" rejang traditional food in Bengkulu Province. Agrisep. 2014; 14(1): 61-9.
2. Al-Shookri A, Al-Shukaily L, Hassan F, Al-Sheraji S, Al-Tobi S. Effect of mothers nutritional knowledge and attitudes on Omani children's dietary intake. Oman Medical Journal. 2011; 26(4): 253–7.
3. Sharif MSM, Nor NM, Zahari MSM. The effects of transmission of malay daily food knowledge on the generation practices. Procedia - Soc Behav Sci [Internet]. 2013; 85: 227–35.
4. Yabancı N, Kısaç İ, Karakuş SŞ. The effects of mother's nutritional knowledge on attitudes and behaviors of children about nutrition. Procedia-Soc Behav Sci. 2014; 116: 4477–81.
5. Oly-Alawuba, Ihedioha SA. Nutritional knowledge of mothers/caregivers and anthropometric indices of children (2-5 years) in Obowo local government area, Imo State, Nigeria. International Journal of Innov ative Studies in Science and Engineering Technology. 2018; 4(1): 19–23.
6. García Cruz L, González Azpeitia G, Reyes Súarez D, Santana Rodríguez A, Loro Ferrer J, Serra-Majem L. Factors associated with stunting among children aged 0 to 59 months from the central region of Mozambique. Nutrients Journal. 2017; 9(5): 491–507.
7. Simanjuntak BY, Haya M, Suryani D, Ahmad CA. Early inititation of

breastfeeding and vitamin a supplementation with nutritional status of children aged 6-59 months. Kesmas: National Public Health Journal 2018; 12(3): 107–13.

8. Edith M, Priya L. Knowledge, attitude, and practice (KAP) survey on dietary practices in prevention of malnutrition among mothers of under-five children. Manipal Journal of Nursing and Health Sciences. 2016; 2(2): 19–24.
9. Saaka M. Relationship between mothers' nutritional knowledge in child-care practices and the growth of children living in impoverished rural communities. Journal of Health, Population and Nutrition. 2014; 32(2): 237–48.
10. Direktorat Jenderal Bina Gizi dan Kesehatan Ibu dan Anak. Keputusan Menteri Kesehatan Republik Indonesia No. 1995/Menkes/SK/XII/2010 tentang standar antropometri penilaian status gizi anak. Kemenkes RI; 2011.
11. Galgamuwa LS, Iddawela D, Dharmaratne SD, Galgamuwa GLS. Nutritional status and correlated socio-economic facto rs among pre-school and school children in plantation communities, Sri Lanka. BMC Public Health. 2017;17(1):1–11.
12. Vereecken C, Rovner A, Maes L. Associations of parenting styles, parental feeding practices and child characteristics with young children's fruit and vegetable consumption. Appetite. 2010; 55(3): 589–96.
13. Perkins JM, Kim R, Krishna A, McGovern M, Aguayo VM, Subramanian S V. Understanding the association between stunting and child development in low and middle income countries: Next steps for research and intervention. Social Science and Medicine. 2017; 193: 101–9.
14. Pawenrusi EP. Factors Related to the nutritional status of children in area served by the Pattingalloang Health Center, Makassar. Pakistan Journal of Nutrition. 2016; 15(4): 333–6.
15. Adnan N, Muniandy ND. The relationship between mothers' educational level and feeding practices among children in selected kindergartens in Selangor, Malaysia: A cross-sectional study. Asian Journal of Clinical Nutrition. 2012; 4: 39–52.
16. Farhana JA, Akther F, Talukder MU, Islam A, Islam T, Bhuyan AH. Role of mothers' nutritional knowledge, nutritional factors on the school performance. International Journal of Public Health Science. 2015; 4(1): 44–9.
17. Steward CP, Iannotti L. Dewey KG, Michaelsen KF, Onyango AW. Contextualizing complementary feeding in broader framework for stunting prevention. Maternal& Child Nutrition. 2013; 9: 27–45.
18. Capanzana MV, Aguila DV, Gironella GMP, Montecillo KV. Nutritional status of children ages 0 – 5 and 5 – 10 years old in households headed by fisherfolks in the Philippines. Archives of Public Health. 2018; 76(24): 1–8.
19. Sarma H, Khan JR, Asaduzzaman M, Uddin F, Tarannum S, Hasan MM, et al. Factors influencing the prevalence of stunting among children aged below five years in Bangladesh. Food and Nutrition Bulletin. 2017; 38(3): 291–301.
20. Roche ML, Creed-Kanashiro HM, Tuesta I, Kuhnlein HV. Traditional food diversity predicts dietary quality for the Awajún in the Peruvian Amazon. Public Health Nutr. 2008;11(5):457–465.
21. Lipoeto NI, Geok Lin K, Angeles-Agdeppa I. Food consumption patterns and nutrition transition in South-East Asia. Public Health Nutrition. 2013;16(9):1637–1643.
22. Olack B, Burke H, Cosmas L, Bamrah S, Dooling K, Feikin DR, et al. Nutritional status of under-five children living in an informal urban settlement in Nairobi, Kenya. Journal of Health, Population and Nutrition. 2011; 29(4): 357–63.
23. Derso T, Tariku A, Biks GA, Wassie MM. Stunting, wasting and associated factors among children aged 6-24 months in Dabat health and demographic surveillance system site: a community based cross-sectional study in Ethiopia. BMC Pediatr. 2017; 17(1): 1–9.

Rafitha *et al. Kesmas: National Public Health Journal.* 2019; 14 (2): 65-69
DOI: 10.21109/kesmas.v14i2.3008

Overweight and Obesity Status with Dental Caries among Children Aged 7–12 Years Old in Badung District, Bali 2018

Hariani Rafitha[1], Putri Bungsu[1*], Ratna Djuwita[1], Dwi Gayatri[1], Fakhrana Ariani Ayub[2]

[1]Epidemiology Department, Faculty of Public Health, Universitas Indonesia, Depok, Indonesia, [2]Prosthodontics Department, Faculty of Dentistry, Universitas Indonesia, Jakarta, Indonesia

Abstract

Dental caries is an infectious disease that dental is characterized by the dental damage resulting from microorganism products in carbohydrate fermentation. Dental caries and obesity in children are multifactorial diseases associated with eating habits and certain lifestyle factors. This study aimed to assess the association between overweightness, obesity, and dental caries among children aged 7–12 years in Badung District, Bali Province in 2018. The total sample of 426 children and their mothers were recruited from all first to fifth elementary grade students in three schools selected by simple random sampling. The logistic regression analysis has demonstrated a significant association between obesity and dental caries (OR: 1.830; 95% CI: 1.230–2.722) and showed that after controlling for the confounding variables, obese children have a twice higher chance of experiencing dental caries than non-obese children. Therefore, strengthening the existing health education programs in schools, including those on healthy food or snack components, and improving the efficiency of physical activities for preventing obesity could be a short-term strategy to protect school children from childhood obesity and dental caries.

Keywords: Badung District, dental caries, elementary school dental health, obesity

Introduction

Caries is the most common infectious disease in childhood, affecting 60% - 90% of children worldwide.[1] Children aged 6–11 years have experienced permanent dental caries with various proportions from 14% to 29% in 2011 - 2012.[2] In addition, studies pointed out the varying prevalence of caries in children across the globe, with the values reaching 36% - 85% in Asia, 38% - 45% in Africa, and 22% - 61% in the Middle East.[3] Cambodia and Indonesia reported that the excessive burden of dental caries in children has reached 90%.[3] According to the 2007 National Basic Health Survey, the prevalence of child dental and oral problems in Indonesia was 23.4%, which gradually increased to 25.9% in 2013.[4] Moreover, the dental caries prevalence data in 2013 illustrated that 53.7% of Indonesian people had caries and 72.6% experienced caries.[5]

Caries is a multifactorial symptom that could occur through interaction of certain factors, including cariogenic microorganisms, oral hygiene behaviors, eating habits, dietary carbohydrates, socioeconomic conditions, and other factors.[6] Caries is caused by *Streptococcus* mutans, which inhabits the surface of teeth plaque.[7] *Streptococcus* mutans produces acid which would generate organic acids in the pH range of 3.8 to 4.8 when exposed to dietary carbohydrates. This acidity could cause demineralization on the tooth surface, which might result in cavities in the enamel layer. If left untreated, this condition often becomes detrimental to the deep tooth layers, causing severe pain, difficulty in chewing food, and production of digestive disturbances, which might lead to malnutrition.[7-9] Another factor is the high consumption of carbohydrate, which would increase the body weight and the prevalence of dental caries.[10]

Obesity is the result of chronic inconsistency between

How to Cite: Rafitha H, Bungsu P, Djuwita R, Gayatri D, Ayub FA. Overweight and obesity status with dental caries among children aged 7-12 years old in Badung District, Bali 2018. Kesmas: National Public Health Journal. 2019; 14 (2): 65-69. (doi:10.21109/kesmas.v14i2.3008)

Correspondence: Putri Bungsu, Epidemiology Department, Faculty of Public Health, Universitas Indonesia, A Building 1st Floor, Kampus Baru UI Depok, Indonesia, Phone: +6282122044786, E-mail: putri.bungsu10@ui.ac.id*
Received : February 14th 2019
Revised : June 26th 2019
Accepted : July 15th 2019

food intake and energy use.[11] The majority of overweight children follow a lifestyle of high-fat and high-carbohydrate food intake but sedentary lifestyle.[11] A distinct relationship exists between high sugar consumption, which is an important risk factor for obesity, and dental caries.[12] Obesity is a chronic disease that is considered a global epidemic. The prevalence of obesity worldwide is a major concern because of its long-term potential impact on morbidity, mortality, and health care costs.[13] Obese children are more likely to be overweight in their adulthood and face increased risks of morbidity and mortality.[13]

According to the World Health Organization (WHO), obesity has reached epidemic proportions globally, with more than one billion adults being overweight and at least 300 million of them being clinically obese; obesity is also a major contributor to the global burden of chronic diseases and morbidity.[14] Although obesity only occurs in high-income countries, the WHO reports that overweight and obesity are currently dramatically increasing in low- and middle-income countries.[15] The global prevalence of obesity in children has increased substantially in recent years.[13] In the United Kingdom, the prevalence of overweightness and obesity in adolescents (11 - 15 years) increased from 28% (male) and 30% (female) in 1995 to 36% for both male and female in 2013.[13]

Indonesian National Health Survey of 2013 stated that Indonesia faces the problem of overweightness and obesity in children aged 5 - 12 years, with a total prevalence of 18.8% (overweightness: 10.8%; obesity: 8%).[4] A total of 15 provinces, including Bali Province, present higher rates of overweightness and obesity among children aged 5 - 12 years compared to the national average.[4] Bali Province had a prevalence rate of 21.4%, with 12.6% accounting for overweightness and 8.8% representing obesity.[16] In addition, 39.8% of people have dental caries, and 65.6% have experienced dental caries in Bali Province.[5] Badung District is one of three districts in Bali Province with high rates of overweightness and obesity, exceeding the national average.[16] Badung District has a total prevalence rate of 30.1% for overweightness and obesity, with 14.9% accounting for overweightness and 15.2% accounting for obesity. Badung District also features a dental caries prevalence approaching the national average, e.g., 43% of people have dental caries, and 63.7% had experienced dental caries.[16] This study aimed to assess child overweightness and obesity in relation to dental caries in Badung District, Bali Province.

Method

This quantitative study was employing a cross-sectional study approach, and it used primary data by dental caries examinations, measuring body weight, height, and interviewing the respondents' mothers in May 2018. This study evaluated the causal relationship between obesity status and dental caries. The independent variable was obesity status, which was divided into the exposed group if the respondents' weight-for-height Z-scores were ≥+2 standard deviation (SD)(overweight or obese) and non-exposed group if the Z-scores were −2 SD until +2 SD (normal). The outcome was dental carries among children 7 - 12 years. This study also measured other variables, such as maternal education, maternal employment, family income, fast food intake, snack and sweet drinking intake, and oral hygiene, which were evaluated as potential confounders. The study population included all primary school children in Badung District, Bali Province and their mothers, and the study sample comprised of all elementary school students grade 1 - 5 from three randomly selected public elementary schools. The selection of three public primary schools was carried out through simple random sampling from a list of 255 public elementary schools in Badung District. The sample size was calculated by the two-proportion formula and by 344 samples. Missing data were considered in this study. The study sample was then added to the 426 children who had met the study inclusion criteria, including parent approval, school attendance during the study data collection, returning of the questionnaire, and willingness to undergo anthropometric measurement at the time data collected. Data collection was carried out by using digital scales and microtoize height gages. Dental examinations were performed by using oral diagnostic tools, which were sterilized by immersing the appliance in 5.25% sodium hypochlorite solution with 1:10 dilution.[17] A questionnaire related to oral hygiene behavior was adapted from the previous study questionnaire of Winnier JJ *et al.*,[18] e.g., Oral Hygiene Maintenance in Children—A survey of Parental Awareness. Furthermore, food frequency questionnaires were adapted from the work of Olivia Teresa Boniface,[19] concerning the validation of a short food frequency questionnaire that ranks pacific Islanders living in South Auckland, New Zealand by sugar intake. The questionnaire was tested on 36 students from 02 Kerobokan Kelod Elementary School. The data retrieval procedure started with the distribution of consent sheets accompanied by a questionnaire for mothers of students through students who came to school assisted by the teacher; the students were instructed to return the questionnaire the next day or after a maximum of two days. After the approval sheet and questionnaire were returned to the researcher, the study was continued by examining the teeth, weight, and height of the children. The students were excluded from the study in case of failure to return the approval sheet and questionnaire. The examination

in this study was carried out by the researcher and a research assistant who is a graduate student of the Faculty of Public Health Universitas Indonesia. The research assistant was assigned to document or record the obtained data following the instructions of the researcher. The data were analyzed by using chi-square as crude analysis and logistic regression as multivariate analysis. This study was approved by the institutional review board of the Faculty of Public Health Universitas Indonesia with research ethics number 470/UN2.F10/-PM.00.02/2018.

Results

Table 1 illustrates that the proportion of overweight and obese children (51.2%) is slightly higher than children with normal nutritional status (48.8%). The table also shows that of 426 respondents, 229 children (53.8%) have a high number of dental caries with a decay-missing-filled teeth (DMF-T) score > 3. The remaining 197 children (46.2%) presented a low dental caries status with a DMF-T score ≤ 3.

Table 1. Distribution of Respondents by Characteristics of Mother and Child, Diet, Oral Hygiene Behavior, and Childhood Overweightness and Obesity Status

Variable	Category	n	%
Status of obesity	Overweight & obesity (Z-score > 1 SD)	218	51.2
	Normal (Z-score -2 SD to 1 SD)	208	48.8
Dental caries status	Height (DMF-T > 3)	229	53.8
	Low (DMF-T ≤ 3)	197	46.2

Notes: DMF-T : Decay-missing-filled teeth

Table 2 demonstrates that overweight and obese children account for a higher proportion of dental caries experience (60.6%) compared with normal children (52.0%). Moreover, a statistically significant relationship was observed between overweightness and obesity and the incidence of dental caries (odds ratio (OR): 1.72; 95% confidence interval (CI): 1,17–2,52). Therefore, overweight and obese children have 1.72 odds of experiencing dental caries compared to normal-weight children. Table 2 also shows three other variables forming a relationship with dental caries; such as fast food diet (OR: 1.50; 95% CI: 1,02–2,20), sugary snack and beverage diet (OR: 1.65; 95% CI: 1.12–2.42), and oral hygiene habit (OR 1.60; 95% CI: 1.086–2.34).

Five variables had a p-value < 0.25: obesity status, fast food eating pattern, snack and sweet drink diet, oral hygiene behavior, and family income (Table 3). These five variables were included in the multivariate analysis. The confounding assessment in this study was run in stratification analysis by comparing the OR values to the exposure variables before and after the covariate was removed from the model (Table 4).

Table 4 shows that all candidate variables that are candidates for the multivariate analysis are confounding

Table 2. Relationship between Characteristics of Mother and Child, Diet, Oral Hygiene Behavior, and Status of Obesity

Variable	Category	Dental Caries Status		OR	p-Value
		High*	Low*		
Status of obesity	Obesity	126 (60.6)	82 (39.4)	1.72	0.006 *
	Normal	103 (47.3)	115 (52.8)	(1.17–2.52)	
Mother's education	Under senior high school	90 (54.9)	74 (45.1)	1.08	0.713
	Senior high school and above	139 (53.0)	123 (47.0)	(0.73–1.59)	
Mother's employment	Employed	158 (55.4)	127 (44.6)	1.23	0.322
	Unemployed	71 (50.4)	70 (49.7)	(0.82–1.84)	
Family income	Under minimum wage	54 (62.1)	33 (37.9)	1.53	0.081
	RMW and above	175 (51.6)	164 (48.4)	(0.95–2.49)	
Child's sex	Male	116 (54,5)	105 (47.5)	0.84	0.380
	Female	113 (55.1)	92 (44.9)	(0.57–1.24)	
Fast food (carbohydrate) diet	High	123 (58.9)	86 (41.2)	1.50	0.038 **
	Low	106 (48.9)	111 (51.2)	(1.02–2.20)	
Snack / sweet drinking diet	High	126 (60.0)	84 (40.0)	1.65	0.011 **
	Low	103 (47.7)	113 (52.3)	(1.12–2.42)	
Oral hygiene	Not good	138 (59.0)	96 (41.0)	1.60	0.017 **
	Good	91 (47.4)	101 (52.6)	(1.09–2.34)	

Notes: *n(%), **p-value < 0.05, OR = Odd Ratio, RMW = Regional Minimum Wage

Table 3. Variables that Meet Criteria for Multivariate Analysis

Variable	p-Value	OR	95% CI
Family income	0.081	1.53	(0.95–2.50)
Fast food diet	0.038	1.50	(1.02–2.20)
Sweet snack pattern	0.011	1.65	(1.12–2.42)
Oral hygiene behavior	0.017	1.60	(1.09–2.34)
Status of obesity	0.006	1.72	(1.17–2.52)

Notes: CI = Confidence Interval, OR = Odds Ratio

Table 4. Conclusion of Confounding Test Results for Multivariate Candidate Variables

Variable	COR	AOR	Confounding	Interaction
Status of obesity	1.72			
Fast food diet		1.74	+	-
Sweet snack pattern		1.70	+	-
Oral hygiene behavior		1.66	+	-
Family income		1.83	+	-

Notes: COR = Crude Odds Ratio, AOR = Adjusted Odds Ratio

Table 5. Final Model of Multivariate

Variable	Wald	p-Value	OR	95% CI
Obesity	9.23	0.003	1.83	1.23 - 2.72
Family income	5.75	0.034	1.72	1.04 - 2.84
Sweet snack / drink diet	6.78	0.009	1.69	1.14 - 2.50
Oral hygiene	6.69	0,010	1.68	1.13 - 2.50

Notes: CI = Confidence Interval, OR = Odd Ratio

variables. Thus, the mentioned five variables were continually used in the multivariate analysis. The final stage of the multivariate analysis involved the calculation for the logistic regression tests carried out using backward method.

As shown in Table 5, in the final multivariate results, four variables, including obesity status, family income, snack and sweet drink diet, and oral hygiene behavior, presented a significant relationship with dental caries. Therefore, the incidence of obesity bears a relationship with the incidence of dental caries after controlling for the variables including dietary snack and sweet drinks, family income, and oral hygiene behavior. Obese children aged 7–12 years have an almost twofold risk of experiencing dental caries compared with children who are not obese (OR: 1.83; 95% CI: 1.23–2.72). While, snack diet and sweet drinks, family income, and oral hygiene influenced the relationship of overweightness and obesity with dental caries incidence among children aged 7–12 years in Badung District in 2018.

Discussion

Obesity among children has become the focus of public health throughout the world.[14] The majority of overweight children follow a lifestyle of high-fat and high-carbohydrate food intake and sedentary lifestyle.[11] A distinct relationship exists between high sugar consumption, which is a significant risk factor for obesity, and dental caries.[12] This study compared caries prevalence using the DMF-T index with normal nutritional status and obesity groups, in which the obesity category included the overweight status (Z-score > 1 SD). This study suggests that obesity plays an important role in the incidence of dental caries in children aged 7–12 years after controlling for variables such as family income, oral hygiene behavior, snack diet, and sweet drinks.

This study is similar to the study by Hayden C *et al.*,[20] who stated the association between obesity and dental caries with a p-value of 0.049.[20] Moreover, *Bhayat et al.*,[10] argued the strong relationship between obesity and dental caries. Their study was conducted on normal samples versus obesity and overweightness samples, obtaining an OR value of 1.77 and p-value of 0.016; thus, children with obesity would be at risk of 1.77 times experiencing dental caries[10] Bafti *et al.*,[11] also suggested the significant relationship between body mass index (normal vs overweight) and dental caries with a p-value of 0.0001 (OR: 1.449).

Tooth decay or caries and obesity are both considered multifactorial entities with genetic predisposition and environmental conditions. Most of the factors involved in obesity and tooth decay result from the changes in lifestyle and environmental factors. This alteration in physical activity and nutrition services occurs at home and school environment.[11] When children frequently watch TV for long durations, they tend to snack more than the normal circumstances, especially on foods containing high amounts of fat and/or sugar. This condition increases the overall calorie intake, which could lead to obesity, and raises the risk of developing tooth decay due to prolonged contact time between food and the teeth surface.[21] In addition, the simultaneous intake of sugary foods might result in weight gain and increase the risk of caries.[10] A relationship exists between obesity and the incidence of dental caries in children aged 7–12 years in Badung District. Obese children would face doubled risk of dental caries compared with children who are not obese. This result suggests that if childhood obesity could be prevented among children, then they are less likely to experience dental caries. Therefore, strengthening the existing health education programs in schools, including those on healthy food or snack components, and improving the efficiency of physical activities for preventing obesity could be a short-term strategy to protect school-age kids from childhood obesity and dental caries.

This study discovered that covariate variables, such as family income, eating habits and sweet drinks, and oral hygiene behavior, influence the strength of the relationship between overweightness and obesity among children and dental caries. Family income can affect dental caries, as proven by a previous study reporting that family income was significantly related to the low prevalence of dental caries in children (OR: 1.22; 95% CI: 1.01–1.50).[22] Furthermore, snacks or sweet drinks were found to be significantly associated with dental caries in children (OR: 1.686; 95% CI : 1.03–1.50).[23] A previous study showed a similar result, revealing a significant relationship between the frequency of sugar intake and dental caries. Dietary habits play an important role in the development of dental caries, mainly because of high rates of carbohydrate fermentation.[24] Oral hygiene behavior can also influence the relationship between obesity and dental caries. This study revealed a significant relationship between dental hygiene practices and caries (OR: 1.683; 95% CI: 1.13–2.50). Similar results were obtained in the previous study of Wu L *et al.*[12] The findings indicate that in relation to the oral hygiene behavior, the mouth condition would be protected from bacteria.[25]

Conclusion

A relationship exists between obesity in children and the incidence of dental caries after controlling other variable in children aged 7–12 years in Badung District,while obese children show two-fold the risk of dental caries compared to children who are not obese.

References

1. So M, Ellenikiotis YA, Husby HM, Paz CL, Seymour B, Sokal-Gutierrez K. Early childhood dental caries, mouth pain, and malnutrition in the ecuadorian amazon region. International Journal Environmental Research Public Health. 2017; 14 (550): 1-12.
2. Dye B, Thornton-Evans G, Li X, Iafolla TJ. Dental caries and sealant prevalence in children and adolescents in the United States, 2011 – 2012. NCHS Data Brief. 2015; (191): 1-8.
3. World Health Organization. Expert consultation on public health intervention against early childhood caries. 2016: 1-28.
4. Badan Penelitian dan Pengembangan Kesehatan Kementerian Kesehatan RI. Riset Kesehatan Dasar (RISKESDAS) 2013. Lap Nas 2013. 2013: 1-384.
5. Kementerian Kesehatan Republik Indonesia. Profil pelayanan kesehatan gigi dan mulut; 2014.
6. Duangthip D, Gao SS, Lo ECM, Chu CH. Early childhood caries among 5- to 6-year-old children in Southeast Asia. International Dental Journal. 2017; 67 (2): 98-106.
7. California Dental Association. Early childhood caries. 1201 K Street, Sacramento. 2017: 1-2.
8. Wong A, Subar PE, Young DA. Dental caries: An update on dental trends and therapy. Advances in Pediatrics. 2017; 64 (1): 307-30.
9. Mishu M, Hobdell M, Khan M, Hubbard R, Sabbah W, Wael. Relationship between untreated dental caries and weight and height of 6-to 12-year-old primary school children in Bangladesh. International Journal of Dentistry. 2013: 10-14.
10. Bhayat A, Ahmad MS, Fadel HT. Association between body mass index, diet and dental caries in grade 6 boys in Medina, Saudi Arabia. East Mediterranean Health Journal. 2016; 22 (9): 687-93.
11. Bafti LS, Hashemipour MA, Poureslami H, Hoseinian Z. Relationship between body mass index and tooth decay in a population of 3 – 6-year-old children in Iran. International Journal of Dentistry. 2015.
12. Wu L, Chang R, Mu Y, Deng X, Wu F, Zhang S, et al. Association between obesity and dental caries in chinese children. Caries Research. 2013; 47 (2): 171-6.
13. Hall-Scullin EP, Whitehead H, Rushton H, Milsom K, Tickle M. A longitudinal study of the relationship between dental caries and obesity in late childhood and adolescence. Journal Public Health Dentistry. 2017; (4).
14. World Health Organization. Regional Office for South-East Asia. Overweight and obesity fact sheet. 2011: 1-2.
15. Krishnamurthy K, Bangar BR, Raja A, Gujaral GS, Randive SB, Vaishnav KP. Body mass index and its impact on dental caries. 2017; 10 (4): 810-4.
16. Riskesdas Provinsi Bali. Riset Kesehatan Dasar 2013 Provinsi Bali. Kementerian Kesehatan Republik Indonesia; 2013.
17. CDC. Infection control guideline for disinfection and sterilization in healthcare facilities. Edits and Changes February 2017; 2017 [cited 2019 Jul 3]. Available from: https://www.cdc.gov/infection-control/guidelines/disinfection/updates.html#anchor_1554393470.
18. Winnier JJ, Parmar A, Mehta S, Bambal K, Bhatia R. Oral hygiene maintenance in children: a survey of parental awareness. International Journal Oral Health Medical Research. 2015; 6 (3).
19. Boniface OT. Validation of a short food frequency questionnaire which ranks individuals by sugar intakes in pacific islanders in South Auckland, New Zealand. New Zealand; 2013.
20. Hayden C, Jo B, Chambers S, et al. Dental caries is related to obesity in children but the relationship is moderated by socio-economic strata and child age. Journal of Evidence Based Dental Practice. 2018; 14 (1): 16-18.
21. Alswat K, Mohamed WS, Wahab MA, Aboelil AA. The association between body mass index and dental caries: cross-sectional study. Journal of Clinical Medicine Research. 2016; 8 (2): 147-52.
22. Costa LR, Daher A, Queiroz MG. Early childhood caries and body mass index in young children from low income families. BioMed Central Oral Health. 2013; 10: 867-78.
23. Chen KJ, Gao SS, Duangthip D, et al. Dental caries status and its associated factors among 5-year-old Hong Kong children : a cross-sectional study. 2017: 1-8.
24. Anil S, Anand PS. Early childhood caries: prevalence, risk factors, and prevention. Frontiers in Pediatrics. 2017; 5 (157): 1-7.
25. Masyarakat BK, Alhamda S, Gigi JK, Padang PK. Status kebersihan gigi dan mulut dengan status karies gigi (kajian pada murid kelompok umur 12 tahun di Sekolah Dasar Negeri Kota Bukittinggi). Jurnal Berita Kedokteran Masyarakat. 2011; 27 (2): 108-15.

Ramdhan *et al. Kesmas: National Public Health Journal*. 2019; 14 (2): 70-75
DOI: 10.21109/kesmas.v14i2.3165

Kesmas: National Public Health Journal

Personal Exposure of Traffic Policeman to Particulate Matter in Jakarta: Distribution of Size, Chemical Composition, and Work Time

Doni Hikmat Ramdhan[1]*, Eka Fitriani Ahmad[1], Fitri Kurniasari[3], Zuly Prima Rizky[1], Hardy Atmajaya[1], Muhayatun Santoso[2]

[1]Faculty of Public Health, Universitas Indonesia, Indonesia, [2]Center of Nuclear Technology for Materials and Radiometry, BATAN Bandung, Indonesia, [3]Department of Occupational and Environmental Health, Graduate School of Medicine, Nagoya University, Japan

Abstract

Particulate matter (PM) is an air pollutant that has an impact on public health, especially in an urban area. The objective of this study was to analyze the personal concentration of $PM_{2.5}$ and its composition among police working in the roadside area in Jakarta. PM measurement has done to the policeman that controlled traffic on four near highway locations in Jakarta. Sioutas impactor, Leland Legacy personal pump, and quartz fiber filter were chosen to measure the fine particles. Each PM was measured for 8-hour period. PM concentration was analyzed by the gravimetric method while tracing element and black carbon in $PM_{0.25}$ by energy dispersive X-ray fluorescence (EDXRF) and EEL Smoke Stain Reflectometer. As a result, personal $PM_{2.5}$ concentration in Jakarta during weekdays and weekends measurement are 93.43 ± 10.84 µg/m^3, and 75.68 ± 12.01 µg/m^3. S, K, Fe, Ca, Zn, and Pb are major elements found in all locations. The black carbon concentration during weekdays in all location was 11.46 ± 6.97 µg/m^3. A high concentration of fine particles, a traffic-related trace element in $PM_{0.25}$, and black carbon are showed that traffic-related source is the major contributor to a high level of fine particulate matter at near highway locations in Jakarta. The weekday's concentration of $PM_{2.5}$ and $PM_{0.25}$ among Jakarta Policemen was higher than in the weekend concentration. A particle with size of less than 0.25 µm dominated the fine particles concentration. Further researcher is expected to see the difference in the effects of traffic-related particulate matter exposure between traffic policeman and police who work at office.

Keywords: Black carbon, $PM_{2.5}$, particulate matter composition, traffic-related particulate matter

Introduction

Air pollution is a major environmental health problem for both developed and developing countries that may affect human health. WHO reported that there was a steady increase in mortality rate that causes by air pollution from 2008 to 2014.[1] Ambiance air pollution was assumed to hold responsibility for 1.3 million deaths in 2008, 3.7 million deaths in 2012, and 7 million deaths in 2014.[1,2]

Air pollution is the presence of one or more substances in the air that exceed the normal concentration and has the potential to affect human health. By their nature; air pollution source can be classified as natural and anthropogenic sources. The main sources in most areas are vehicle engine combustion, power plant emission, industrial and agriculture activities, cooking activity, re-emission from terrestrial and water surface, chemical production, distribution, and usage.[3] Daily, weekly and seasonal changes of air pollution condition in an area are affected by source activity and meteorological factor.

Jakarta, the capital city of Indonesia, also has an air pollution problem. In the transportation sector, in 2014, Jakarta has about 17 million registered motor vehicles.[4] The fact above leads the road transportation section, along with the industrial section and the domestic waste incineration as a major source of particulate matter (PM) pollutant.[5] Aside from increasing concentration of PM in air ambient, vehicle emission also a major contributor for the increasing concentration of nitrogen oxide (NOx) and other carbon emissions, such as carbon monoxide (CO), black carbon (BC), organic carbon (OC) and

How to Cite: Ramdhan DH, Ahmad EF, Kurniasari F, Rizky ZP, Atmajaya H, Santoso M. Personal exposure of traffic policeman to particulate matter in Jakarta: distribution of size, chemical composition, and work time. Kesmas: National Public Health Journal. 2019; 14 (2): 70-75. (doi:10.21109/kesmas.v14i2.3165)

Correspondence: Doni Hikmat Ramdhan, Faculty of Public Health, Universitas Indonesia, C Building 1st Floor Kampus Baru UI Depok 16424, Indonesia, E-mail: doni@ui.ac.id, Phone: +62 856 9796 8639*

Received : June 21st 2019
Revised : July 28th 2019
Accepted : September 30th 2019

volatile organic compounds (VOCs).[3] PM is a liquid droplet and solid with a microscopic size that suspended in the air and can penetrate deeply into the human's lung and cause an adverse health effect.[6] PM is classified into 3 classes by size, ultrafine (≤ 1 µm), fine (1 - 2.5 µm), and coarse particles (2.5 - 10 µm). Fine particulates (PM 2.5) is notorious for its health effect such as premature deaths in people with heart or lung disease, nonfatal heart attack, heart arrhythmias, aggravated asthma, decreased lung function, increased respiratory symptoms, such as irritation of the airways, coughing or difficultybreathing.

Health effect that caused by PM is affected by its concentration and exposure duration. The study by Committee on the Medical Effects of Air Pollution (COMEAP) shows that there is a correlation between daily exposure of PM with the acute effect of cardiovascular disease, based on the meta-analysis data, every concentration escalation of 10 µg/m^3 will increase 1.4% rela tive risk of death by cardiovascular disease.[7] The other review shows that every concentration escalation of PM in both short-term and long-term exposure has an association with the elevation of death from cardiovascular and lung disease, and from all-cause.[8] While, the long-term exposure of PM has a correlation with the increase of blood markers from cardiovascular disease and elevate of histopathological markers from chronic subclinical lung inflammation and subclinical atherosclerosis.

Vehicle emission release abundance level of particulate matter, the previous study found that the fine particles concentration from vehicle source in motor vehicle testing center that exposes the mechanics extent to 149.01 ± 60.33 µg/m^3.[9] On another study on PM effect from testing of male Fischer 344, it was found that particulate with nanometer size from diesel engine combustion process induces reproductive system disor-ders such elevation of testosterone level in low exposure and middle exposure group.[10]

The health problems that arise due to exposure to $PM_{2.5}$ needs to be undertaken by preventing with a strategic and comprehensive strategy. One of the critical attempts made in disease prevention is to determine the concentration, composition, and size distribution by measure the personal exposure of $PM_{2.5}$ at workers, who work in the roadside area. The objective of this study was to analyze the personal concentration of $PM_{2.5}$ and composition among police who worked in the roadside area in Jakarta.

Method

This study was designed to show the size distribution and chemical composition of fine particles. PM collected for 8 hours from each worker on four roadside area in Jakarta from March to May 2015. Six and four samples collected for weekday and weekend periods in every sample location. PM collection was done according to EPA IP 10 A adapted by SKC. Inc standard (SKC Inc., 2004). The PM concentration analyzed using gravimetric method while the element composition and black carbon were analyzed using Energy Diffraction X-ray Fluorescence (EDXRF) and EEL Smoke Stain Reflectometer respectively.

Fine particles were measured in four sample points in Jakarta. Harmoni, Senayan, Semanggi, and Pancoran were selected as a sample point due to the heavy traffic that always happened in those areas. Sample apparatus placed in the breath zone of the police officer for 8 hours during his shift. Fine particles were measured based on US EPA IP 10 A method that updated by SKC.Inc in 2004. Particulate matters were divided into five groups according to their size using Sioutas Impactor. Sioutas Impactor placed in the breathing zone area of the policeman. Ambient air sucked using Leland Legacy personal pump constantly on 9 L/minute during the measurement. Quarts fiber filter placed in every stage of the Sioutas impactor to filtering the PM.

The concentration of fine particles analyzed using the gravimetric method. Every filter is placed in a balance room for 24 hours prior to the initial and final weighing using microbalance. Qualitative and quantitative analysis of element composition were done using Energy Diffraction X-ray Fluorescence (EDXRF) in Center of Nuclear Technology for Materials and Radiometry, BATAN Bandung. EDXRF is stationary spectrometer and methodical analysis of energy-dispersive X-Ray Fluorescence. All of the sample element is excited by bombarding with high-energy X-rays, and an energy dispersive detector in combination with a multi-channel analyzer was used to simultaneously collect the fluorescence radiation emitted from the sample and to separate the different energies of the characteristic radiation from each of the different sample element.[11]

Black carbon concentration analysis was performed using EEL Smoke Stain Reflectometer. Diffusion of light produced by tungsten light will pass through the holes contained in the photocell is shaped like a bracelet, to project and determine sample point, then the light will be reflected back to the photocell. Reflectance obtained from the filter exposed (R in%) will be compared with the reflectance of the empty filter (R0 = 100%). Light reflected by the surface of the exposed filter will pass through several layers of particles on the surface two times, it causes attenuation upon reflection occurs two times.[12]

Continuous data will be displayed in the form of average with a standard deviation (SD) and data obtained from the exposed and unexposed groups are

compared using a two-tailed t-test. This study has been reviewed by the Ethics Commission of Faculty of Public Health Universitas Indonesia (No. 71/2012).

Results

The t-test result in Table 1 shows that the concentration distribution for each PM size is higher on the weekdays than on the weekends. On the weekdays, the distribution of PM concentration is higher in the morning shift (06:00 a.m. - 02:00 p.m.) than in the afternoon shift (02:00 - 08:00 p.m). While, on the weekends, it is higher in the afternoon than in the morning shift, except at Harmoni. On the weekdays, the concentration of personal PM exposure on traffic police at Bundaran Senayan area is the highest concentration compared to other areas. However, on the weekends, the highest PM exposure concentration is at Pancoran.

Figure 1 displays the concentration of element composition from $PM_{0.25}$ from four different locations in Jakarta. There is a similar pattern from elemental composition distribution in all area, where sulphur (S), potassium (K), iron (Fe), carbon (Ca), zinc (Zn), and lead (Pb) concentration were fairly high in all sampling area. If based on each location, the highest concentration of elements in Semanggi are S (2.90 µg/m^3), Ca (1.63 µg/m^3), and Zn (1.4 µg/m^3). In Harmoni, there are Ca (1.14 µg/m^3), Zn (1.07 µg/m^3), and S (0.85 µg/m^3) as the highest element concentration. While in Pancoran the highest concentration are Ca (1.28 µg/m^3), S (1,24 µg/m^3), and Zn (1.14 µg/m^3). Then in Senayan are Ca (1.89 µg/m^3), Zn (0.89 µg/m^3), and Fe (0.65 µg/m^3) as the highest element concentration.

Tabel 1. Size Distribution of Traffic Related Particulate Matter

Location	Shift	Size (µm)	Weekday	Weekend
Harmoni	AM	$PM_{2.5}$	89.25 ± 16.95*,#	80.25 ± 3.27
		PM_1	65.59 ± 5.83	64.43 ± 2.73
		$PM_{0.5}$	49.90 ± 2.36	50.54 ± 3.82
		$PM_{0.25}$	47.48 ± 5.70	53.66 ± 4.70
	PM	$PM_{2.5}$	83.33 ± 14.04*	67.52 ± 8.18
		PM_1	65.33 ± 9.59*	58.26 ± 8.18
		$PM_{0.5}$	54.53 ± 10.92	50.54 ± 7.09
		$PM_{0.25}$	55.08 ± 13.99	55.08 ± 2.69
Bundaran Senayan	AM	$PM_{2.5}$	104.17 ± 6.86*,#	65.35 ± 28.70
		PM_1	76.90 ± 3.96*,#	48.38 ± 19.97
		$PM_{0.5}$	54.27 ± 9.27*,#	38.97 ± 16.91
		$PM_{0.25}$	53.50 ± 7.38*,#	40.36 ± 14.10
	PM	$PM_{2.5}$	88.22 ± 6.35*	85.57 ± 8.62
		PM_1	65.17 ± 1.64*	63.27 ± 4.36
		$PM_{0.5}$	49.23 ± 1.42	49.38 ± 2.18
		$PM_{0.25}$	45.87 ± 2.14	47.48 ± 0.00
Semanggi	AM	$PM_{2.5}$	93.88 ± 5.25*	76.08 ± 2.62
		PM_1	79.48 ± 4.08*,#	60.65 ± 0.44
		$PM_{0.5}$	71.50 ± 4.45*,#	47.84 ± 0.00
		$PM_{0.25}$	51.70 ± 5.40	44.75 ± 2.18
	PM	$PM_{2.5}$	85.57 ± 2.74*	76.77 ± 2.73
		PM_1	71.94 ± 3.25*	62.50 ± 1.09
		$PM_{0.5}$	61.91 ± 1.82*	51.70 ± 1.09
		$PM_{0.25}$	50.33 ± 5.31*	44.37 ± 0.55
Pancoran	AM	$PM_{2.5}$	86.42 ± 3.36*	81.02 ± 0.00
		PM_1	66.10 ± 5.25	61.73 ± 5.46
		$PM_{0.5}$	54.27 ± 1.94	51.31 ± 0.55
		$PM_{0.25}$	40.12 ± 3.54	40.90 ± 3.27
	PM	$PM_{2.5}$	89.76 ± 12.47*	77.35 ± 0.49
		PM_1	52.21 ± 8.25*	42.25 ± 0.05
		$PM_{0.5}$	40.12 ± 5.56*	30.29 ± 0.49
		$PM_{0.25}$	32.92 ± 4.96*	23.23 ± 0.11
All	AM	$PM_{2.5}$	93.43 ± 10.84*	75.68 ± 12.01
		PM_1	72.02 ± 7.72	58.80 ± 9.62
		$PM_{0.5}$	57.48 ± 9.79	47.16 ± 7.85
		$PM_{0.25}$	48.20 ± 7.23	44.92 ± 7.61
	PM	$PM_{2.5}$	86.72 ± 8.91	76.80 ± 7.71
		PM_1	63.66 ± 9.34	56.57 ± 9.11
		$PM_{0.5}$	51.45 ± 9.85	45.48 ± 9.20
		$PM_{0.25}$	46.05 ± 10.97	42.54 ± 11.85

*p < 0.05 compared with the Weekend group
#p < 0.05 compared with the PM group

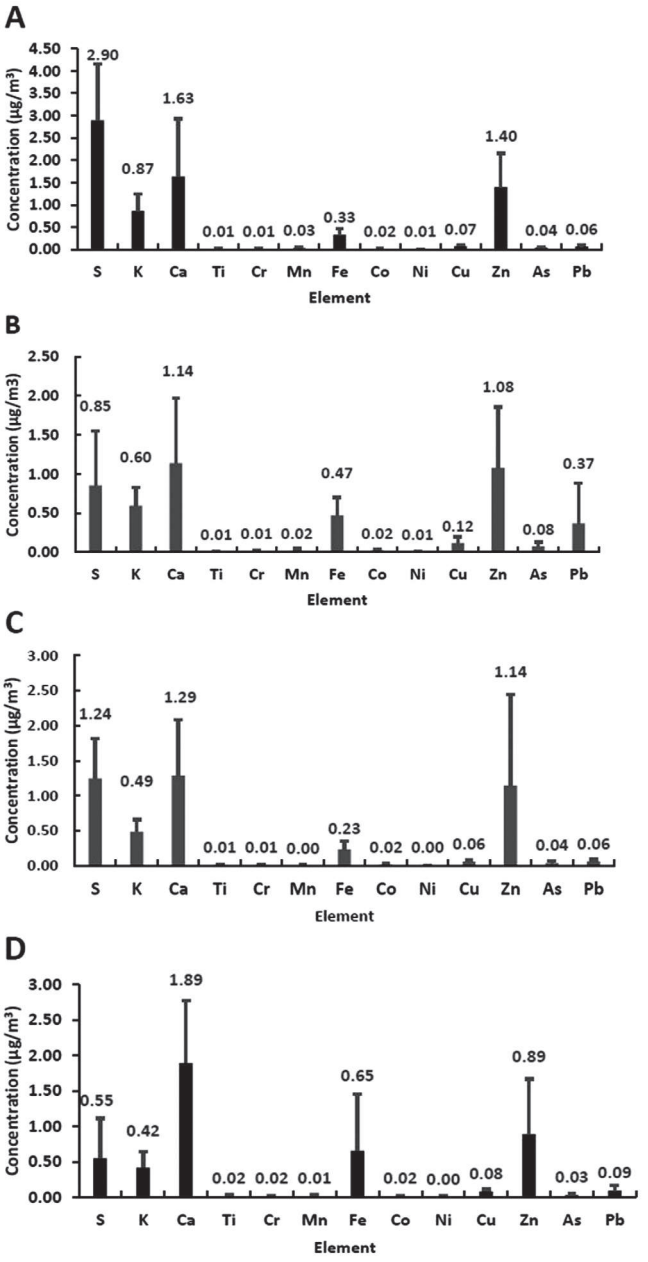
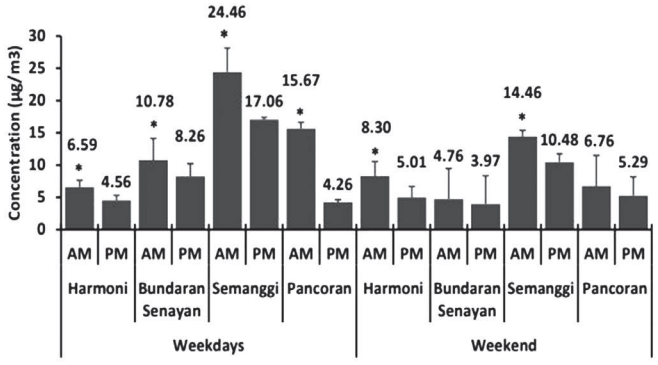


Figure 1. Chemical Composition of Traffic-Related Particulate Matter in Semanggi (A), Harmoni (B), Pancoran (C), and Senayan (D)



Note: *p < 0.05

Figure 2. Black Carbon Concentration of Traffic-Related Particulate Matter

Figure 2 shows that the concentration of black carbon at each location is higher on the weekdays than on the weekends, except in the Semanggi. Based on work shifts, the concentration of black carbon is higher in the morning shift (06:00 a.m. - 02:00 p.m.) than in the afternoon shift (02:00 p.m. - 08:00 p.m.). Then, the location that has the highest black carbon concentration is Semanggi, and the lowest is Harmoni.

Discussion

The study showed that the personal concentration of $PM_{2.5}$ and $PM_{0.25}$ among Jakarta Policemen was higher on weekdays than on the weekend. A particle with a size of less than 0.25 µm dominated the fine particles concentration. High levels of submicron/ultrafine particles indicated that vehicle emission coming from combustion and the high-temperature process was the major source of particulate matter in this study. S, K, Fe, Ca, Zn, and Pb are an element with a high concentration in submicron particulate.

Reduced PM concentration during weekends due to the car-free day program that is held on Sundays. However, because it was only carried out on the North-South route, which was around the Sudirman and Thamrin roads, PM concentrations in the East-West route, such as in the Pancoran area, has the highest concentration on weekends. Measurement point that located at the roadside of the highway is the main reason why the mean concentration of fine particles was fairly high. The other study stated there was a decrease in the mean concentration of fine particles particularly with size within 0.015 - 0.697 µm along with the increasing distance between the highway and the sampling point; this indicates that particles within those sizes were linked to traffic activity.[13] The high concentration of ultrafine particles (< 1 µm) is forming by combustion and high-temperature process.[14] Furthermore, another study also found that vehicle emission is the source of the abundance of ultrafine particles, especially in an urban environment.[15] This study showed that, on the weekdays, PM concentrations were higher in the morning shift. This might be due to the high number of vehicles on the highway. Based on previous study, vehicles on highways in the morning are higher and cause re-emissions through circulation caused by passing vehicles.[16]

In the analysis, element composition in $PM_{0.25}$, was obtained a fairly high sulphur (S) content, where the highest concentration reached 2,897.43 ng/m^3 (Semanggi), while the lowest concentrations of reach 550.83 ng/m^3 (Senayan). That result is in line with previous studies conducted around the highway in the Netherlands and Jakarta where the highest concentration of sulfur in fine particles reach to 1,426.60 ng/m^3 and 1,177.02 ng/m^3 respectively.[17] The high concentration of S occurs due to sulphur usability as an impurity agent of fuel and lubricant additives.[18] Cross & Hunter,[19] in another study stated that sulphur particles appear as a trace species of diesel engines fuels and as lubricants additives.

The emergence of potassium (K) in the air is due to the number of vehicles using diesel engines with a lack of maintenance on the highway. A previous study conducted in 2008 - 2009 showed a considerable difference compared with the results obtained in the present study. Potassium levels found in that study are four times smaller if compared with the levels of potassium in the Semanggi area (867.07 ng/m^3).[17] In the study conducted in the Hsuehshan tunnel, Taiwan indicated that K has an association with the wear debris, re-suspended dust, and emissions from gasoline-fueled vehicles.[20] Potassium appearance also associated with diesel use for diesel engine and engine wear.[19]

Fe, Cu, and Mn are considered a fingerprint of the traffic-related dust. Based on measurements taken in Netherlands, the comparison of concentration levels of Fe, Cu and Mn in $PM_{2.5}$ between the highway and suburban locations in order are 1.9 : 2.3 : 1.4.[21] Moreover, Fe, Cu and Mn concentration in Jakarta are 141.33 ng/m^3, 5.56 ng/m^3, and 7.24 ng/m^3 respectively.[17] When compared to Senayan, Harmony, and Semanggi, which is the location that has the highest concentration of Fe, Cu, and Mn, the levels obtained from previous studies are much lower. Fe, Cu, and Mn concentration in this study are six times, 20 times, and four times higher compared to the study conducted in Jakarta.[17] Other studies related Fe states that the enrichment factor of iron (Fe) in the Hsuehshan tunnel entrance is at 5 - 11, while the exit is at 12 - 21, the difference of these enrichment factors indicate that the Fe contained in the tunnel mostly generated by anthropogenic emissions, not from road dust.[20] Still from the

same study, there is a correlation found among Fe with Cu, Ba, and Sb is all size particles (coarse, fine and ultrafine) as a proof that wears dust is the major contributor of Fe concentration in Hsuehshan tunnel.

Harmoni is a location with the highest $PM_{0.25}$ and Cu concentration. Cu concentration in Harmoni surpass the Cu concentration from the previous study in Netherlands roadside, where Cu mean concentration in fine particles is 28.33 ng/m^3.[22] Other previous studies indicate that Cu was coming from wear-abrasive sources and wear debris.[20-23] Cu appearance is consistent in the roadside area because it is an additional material contained in lubricants, as well as forming during the braking process.[23]

Manganese (Mn) normal annual concentration both in a rural and urban area without manganese pollutant sources is between 0.01 - 0.07 µg/m^3, while common Mn annual mean concentration in the area near the foundries and around Ferro- and silico-manganese industries may rise to 0.2 - 0.3 µg/m^3 and 0.5 µg/m^3 respectively.[24] When compared to the standard before, Mn concentration in Jakarta is still considered safe. From the observation taken, there was no foundries nor Ferro- or silicomanganese industries around all the sample point. Mn in Jakarta air ambient may come from diesel engine exhaust.[20]

Zinc (Zn) is one element that has the highest concentration in all four test sites with mean concentration is 1,126.32 ng/m^3. That concentration is considered fairly high compared to other studies. From the study conducted in Jakarta, Zn was detected up to 18 times lower than the levels of Zn Semanggi.[17] Furthermore, on study conducted in Europe showed the average concentration of Zn in $PM_{2.5}$ around the highway in Rotterdam and for eight highways in Netherlands amounted to 145.55 ng/m^3 and 25.57 ng/m^3 respectively.[21,22] Zinc itself is commonly used as additives or impurities from diesel fuel and lubricants, such as the zinc dialkyl dithiophosphate (ZDDP), which are additives used in a lubricant that is useful to improve the anti-wear properties and antioxidant abilities on fuel.[25]Additives for lubricating oils such as calcium, zinc, and phosphorus generally cannot be detected on diesel fuel, based on that founding, Zn can be used as a fingerprint of organic aerosols generated from the lubricating oil contained in the diesel engines exhaust.[25]

National Ambient Air Quality Standard (NAAQS) specify 0.15 µg/m^3 as the limit concentration of lead (Pb) in air ambient. For measurements taken at four locations in Jakarta, Harmoni had the highest concentration of lead at 0.37 µg/m^3. Pb contained in Harmoni 4 - 6 fold higher compared to other locations, and nine times higher compared to previous studies.[17] Pb itself has a strong correlation with Zn ($r > 0.75$) on fine-particle phase; it shows that Pb may be generated from diesel engines combustion process.[20]

The uppermost and the bottommost concentration of calcium (Ca) in all sampling areas are located in Sena yan with (1,892.52 ng/m^3) and Harmoni with (1,140.62 ng/m^3). The obtained results from this study showed the differences compared to the previous study in the Netherlands where Ca concentration in $PM_{2.5}$ levels in eight locations highways was amounted to 38.04 ng/m^3.[21] Wear debris, road dust, and gasoline were the sources of Ca.[20]

Significant differences between this study and the previous study in Jakarta may occur as a result of several factors. Santoso measures the fine particles for 12 hours long, once in a week for one year period.[17] Sampling method, material, and sampling location are quite different from this study that used personal sampler attached to the policeman who had to manage the traffic during the sampling period.

Black Carbon concentration in Semanggi is higher than the other studies. The US Environmental Protection Agency writes BC concentration from countries around the world in the report for the Congress of Black Carbon.[26] China, as one of the countries with the highest level of BC, has a BC concentration of around 0.3 - 14.2 µg/m^3 in 2006. Furthermore, BC measurements which were conducted in 12 locations in the UK in 2006 alone showed that the average annual concentration of Black Carbon in the UK amounted to 5.0 - 16.0 µg/m^3. Both the UK and China have lower Black Carbon levels compared to the levels obtained in Semanggi. The measurement of Black Carbon that conducted in Pondok Indah Indonesia between 2008 - 2009 also showed that Black Carbon level in that location is still lower than Black Carbon level in Semanggi with a mean concentration of Black Carbon only around 8.17 µg/m^3.[17]

Abundance pollutant from vehicle emission near the sampling location has a major influence of the high level of BC that trapped in the filter. Black carbon was formed from fossil fuels, biofuels, and biomass combustion process biomass.[26] Contrast variation of Black Carbon concentration in an urban and rural area in China, where Black Carbon concentration in a rural area was about 0.3 - 5.3 µg/m^3 while in urban area where up to 9.3 - 14.2 µg/m^3 proved that traffic density take major rules in BC concentration in air ambient.[26]

Conclusion

In conclusion, the weekday's personal concentration of PM in Jakarta Policemen is higher than on the weekend. On weekdays, concentrations of PM are higher in the morning shift than in the afternoon shift. A particle with a size less than 0.25 µm dominated the fine particles concentration. A high concentration of fine particles, a

traffic-related trace element in $PM_{0.25}$, and black carbon are showed that traffic-related source is the major contributor to a high level of fine particulate matter in Jakarta. Further researcher is expected to see the difference in the effects of traffic-related particulate matter exposure between traffic policeman and police who work at office.

Acknowledgments

The authors would like to acknowledge Sutrani Rachmawati for technical help.

References

1. World Health Organization. 7 million premature deaths annually linked to air pollution 2014 [cited 2019 10]. Available from: https://www.who.int/mediacentre/news/releases/2014/air-pollution/en/.
2. World Health Organization. Burden of disease from household air pollution for 2012. Geneva; 2012.
3. Unger N, Bond TC, Wang JS, Koch DM, Menon S, Shindell DT, et al. Attribution of climate forcing to economic sectors. Proceedings of the National Academy of Sciences. 2010; 107(8): 3382-7.
4. Badan Pusat Statistik Provinsi DKI Jakarta. Statistik Transportasi DKI Jakarta 2015. Jakarta: Badan Pusat Statistik Provinsi DKI Jakarta; 2015.
5. Clean Air Asia. The Clean Air Management Profiles (CAMPs) Indonesia. 2010.
6. United States Environmental Protection Agency. Particulate Matter (PM) 2016. Available from: https://www.epa.gov/pm/.
7. Committee on the Medical Effects of Air Pollution. Long-term exposure to air pollution: effect on mortality; 2009.
8. Cao J, Yang C, Li J, Chen R, Chen Bu, Gu D, Kan H. Association between long-term exposure to outdoor air pollution and mortality in China: a cohort study. Journal of Hazardous Materials. 2011 Feb 28; 186(2-3): 1594-600.
9. Rizky ZP, Yolla PB, Ramdhan DH. Particulate matter 2.5 (PM2. 5) personal exposure evaluation on mechanics and administrative officers at the motor vehicle testing center at Pulo Gadung, DKI Jakarta. Reviews on Environmental Health. 2016; 31(1): 185-6.
10. Ramdhan DH, Ito Y, Yanagiba Y, Yamagishi N, Hayashi Y, Li C, et al. Nanoparticle-rich diesel exhaust may disrupt testosterone biosynthesis and metabolism via growth hormone. Toxicology Letters. 2009; 191(2-3): 103-8.
11. Wobrauschek P, Streli C, Lindgren ES. Energy Dispersive, X–Ray Fluorescence Analysis. Encyclopedia of analytical chemistry; 2010.
12. Taha G, Box GP, Cohen DD, Stelcer E. Black carbon measurement using laser integrating plate method. Aerosol Science and Technology. 2007; 41(3): 266-76.
13. Hitchins J, Morawska L, Wolff R, Gilbert D. Concentrations of submicrometre particles from vehicle emissions near a major road. Atmospheric Environment. 2000; 34(1): 51-9.
14. Lippmann M. Environmental toxicants: human exposures and their health effects. 3rd ed. Hoboken: John Wiley & Sons, Inc; 2009.
15. Daher N, Hasheminassab S, Shafer MM, Schauer JJ, Sioutas C. Seasonal and spatial variability in chemical composition and mass closure of ambient ultrafine particles in the megacity of Los Angeles. Environmental Science: Processes & Impacts. 2013; 15(1): 283-95.
16. Rowangould GM. A new approach for evaluating regional exposure to particulate matter emissions from motor vehicles. Transportation Research Part D: Transport and Environment. 2015 January 1; 1(34): 307-17.
17. Santoso M, Lestiani D, Markwitz A. Characterization of airborne particulate matter collected at Jakarta roadside of an arterial road. Journal of Radioanalytical and Nuclear Chemistry. 2013; 297(2): 165-9.
18. Hu Z, Zhang L, Li Y. Investigation of tall oil fatty acid as antiwear agent to improve the lubricity of ultra-low sulfur diesels. Tribology International. 2017 October 1; 1(114): 57-64.
19. Cross E, Sappok A, Fortner E, Hunter J, Jayne J, Brooks W, et al. Real-time measurements of engine-out trace elements: application of a novel soot particle aerosol mass spectrometer for emissions characterization. Journal of Engineering for Gas Turbines and Power. 2012; 134(7): 072801.
20. Lin Y-C, Tsai C-J, Wu Y-C, Zhang R, Chi K-H, Huang Y-T, et al. Characteristics of trace metals in traffic-derived particles in Hsuehshan Tunnel, Taiwan: size distribution, potential source, and fingerprinting metal ratio. Atmospheric Chemistry and Physics. 2015; 15(8): 4117-30.
21. Boogaard H, Kos GP, Weijers EP, Janssen NA, Fischer PH, van der Zee SC, et al. Contrast in air pollution components between major streets and background locations: particulate matter mass, black carbon, elemental composition, nitrogen oxide and ultrafine particle number. Atmospheric Environment. 2011; 45(3): 650-8.
22. Strak M, Steenhof M, Godri KJ, Gosens I, Mudway IS, Cassee FR, et al. Variation in characteristics of ambient particulate matter at eight locations in the Netherlands–The RAPTES project. Atmospheric Environment. 2011; 45(26): 4442-53.
23. Çuvalcı H, Celik HS. Investigation of the abrasive wear behaviour of ZA-27 alloy and CuSn10 bronze. Journal of materials science. 2011 July 1; 46(14): 4850-7.
24. World Health Organization. Air Quality Guidelines 2001.
25. Zhang J, Spikes H. On the mechanism of ZDDP antiwear film formation. Tribology Letters. 2016 August 1; 63(2): 24.
26. U.S. Environmental Protection Agency. Report to congress on black carbon; 2012.

Asyary *et al. Kesmas: National Public Health Journal.* 2019; 14 (2): 76-81
DOI: 10.21109/kesmas.v14i2.2574

Users' Perception of the Hospital Information System in a Maternity Hospital in Lampung, Indonesia

Al Asyary[1*], Arief Kurniawan Nur Prasetyo[2], Tris Eryando[1], Solvay Gerke[3]

[1]Faculty of Public Health, Universitas Indonesia, Depok, Indonesia, [2]Sisfomedika Co. Ltd./Study Program of Medical Records and Health Information, Faculty of Health, Jenderal Achmad Yani University, Yogyakarta, Indonesia, [3]Center for Development Research, University of Bonn, Bonn, Germany

Abstract

Hospital information systems (HIS) have been applied on a massive scale; however, user evaluation of their effectiveness, efficiency, and service quality improvements remain rare. This study aimed to describe the utility of information systems from the users' point of view by using the Technology Acceptance Model (TAM) in a maternity hospital in Lampung, Indonesia. The study provided an overview of the features of the information system and the workflow of the user through this information system. Screenshots were taken by using Camtasia Studio 2.0 Trial Version application software for one day (two shifts) in the outpatient service. The HIS generally supported the workflow, but not all application modules were fully applied. The obstacles appear to be at the registration unit/outpatient registration and queue dashboard, cashier unit, pharmacy unit, medicine storage/room, and poly unit/checking room. A TAM framework, which included perceived ease of use and perceived usefulness of the information system, revealed that the currently implemented HIS was not perceived as optimal. However, users are still optimistic and aware of the usefulness of the information system in supporting their jobs. Thus, leaders have committed to initiate the potential development of this information system in the inpatient polyclinic.

Keywords: Health informatics, hospital information systems, users' perception

Introduction

Generally, the development of information system in the health care service is focused on designing and applying information technology that is suitable for the health care sector.[1,2] Therefore, the assumption is that information system implementation only looks at the way the system is designed and purchased in its developmental stage.[3] It is very rare to pay attention to the level of acceptance by health care workers as end users during the development of an information system. Consequently, there are many cases of information system implementation failure because of users' resistance to use such information technology. Harmony between technology and healthcare workers' systems will bring about user acceptance of or resistance to the technology and determine whether they use it and integrate it into their routines.

In several studies, there are many exceptions, such as the framework for evaluating an information system in the health care service. However, in explaining and knowing the general reaction of the user toward the information system, the Technology Acceptance Model (TAM) is one commonly used model, comprising as much as 10% of all models evaluating information systems.[4] A percentage of 30%-40% shows significant result toward the acceptance of user's technology, although it is still simple.[5] In health care services, the TAM framework is considered to be too economical. It is because of the actualization of this simple concept has not been able to be developed yet in a more detailed and in-depth way as the thought framework in exploring user's acceptance as one of the important aspects in the

How to Cite: Asyary A, Prasetyo AKN, Eryando T, Gerke S. Users' perception of the hospital information systems in a maternity hospital in Lampung, Indonesia. Kesmas: National Public Health Journal. 2019; 14(2): 76-81. (doi: 10.21109/kesmas.v14i2.2574)

Correspondence: Al Asyary, Faculty of Public Health, Universitas Indonesia, A Building 2nd Floor Kampus Baru UI Depok 16424, Indonesia, Phone/Fax: +6221-7863479, E-mail: al.asyary13@gmail.com*

Received : October 24th 2018
Revised : January 24th 2019
Accepted : September 6th 2019

information system implementation business in health care service.[6,7]

A maternity hospital in Lampung Province is currently applying the Computerized Provider Order Entry system as the clinical information system for supporting health care services in the outpatient polyclinic. In simple terms, the provider, in this case, the specialist physician, orders a prescription, a physician's assistant (nurse in the examination room/polyclinic) inputs the prescription into the system, the prescription is transmitted to other units, and the patient obtains the prescribed medication from the pharmacy unit. The outpatient information system consists of four units, that are registration, the practice room, the pharmacy and pharmacy storage, and the cashier. There are 20 end users, each of whom has direct access to or can deal with one or more units, for example, one end user can deal with the registration unit and the cashier unit. The outpatient service can be run in two shifts, shift I (07:00 a.m. - 02:30 p.m.) and shift II (02:30 p.m. - 09:00 p.m.). Therefore, the aim of this study was to describe information system utilization from the perspective of users by applying the TAM framework in the early phase of the implementation of a clinical information system at a maternity hospital in Lampung.

Method

A system analysis with action research was conducted to evaluate to what extent the information system was used, including which features were used and which were not used, in the line of duty. Furthermore, information system utilization perception of users was also measured by using the TAM framework, which focused on perceived of ease of use and perceived usefulness. The semi-structured questionnaire of the TAM model framework was used to evaluate these two aspects. Perceived ease of use is determined by examining the degree to which someone believes that a technology can be used easily. Perceived usefulness measures the degree to which someone feels that a technology benefits their productivity. Furthermore, to assess problems that occur while using the features of the information system modules, whether it be in commonly used or rarely used modules, a screenshot should be taken by using the software application Camtasia Studio 2.0 Trial Version 30 days for one day (two shifts) of the outpatient service.

These features in the information system are emphasized by four criteria; that are the patient's sociodemographic data, including the patient's full name (given and family names), the patient's telephone number, the patient's full address, the patient's age, the patient's emergency contact or guardian, and the consent form; the patient's medical records; validation of the patient's medical records by medical personnel or other personnel involved in the patient's treatment, so that the information can be accounted for legally; and admission procedures (administrative), including the date, time, filling in the fixated line also applying how to correcting the correct.[8] Thus, from the workflow or the line of work, the types and frequencies of existing problems can be identified. This includes the temporal aspect, use of application features, inputted data visit, and outputted data visit (Figure 1).

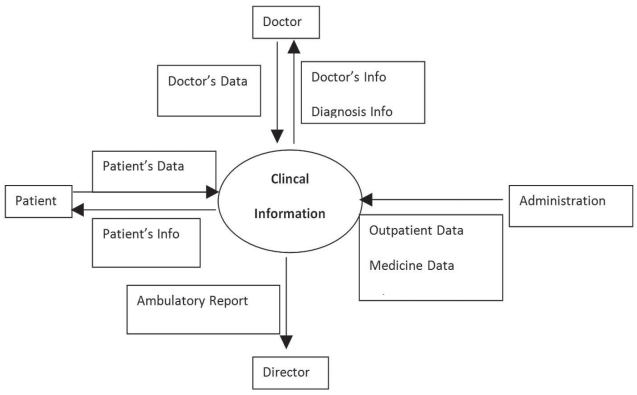


Figure 1. The Evaluation Framework of a Maternity Hospital in Lampung

This study collected and analyzed data using the framework to search for further structure of module features. Observations were conducted in stages to obtain an overview of the users' options when they worked with the hospital information system (HIS) module features. For example, when the user chooses/clicks on the "Registration" menu, three options of module features will appear, consisting of "Outpatient," "Inpatient," and "Emergency" modules. Each of these chosen/clicked menus would prompt the user to select one of several 'module" features in this HIS. The sequence of the table is defined by which one of the menus and modules appeared first as the prompt click/choose.

This study continued to present additional modules according to each user's privileges. This indicated that only certain units could have access to these modules. For example, the cashier unit can only see the "Receipts Printing", "Outpatient Cashier", "Prescription Printing", "Inpatient Cashier," and "Income Report" module features on their HIS screen and do not have access to the inpatient nursing station unit. Users at the latter could only see nursing examination modules for work. The sequence numbers of these unit and privilege modules were defined by impromptu options that were chosen/clicked.

A letter of permission to conduct research at an maternity hospital in Lampung was from the Director of the Hospital. The data were confidential, and only the study investigators could access the data. This study also passed Ethics Review from the Concentration of Health Management and Information Systems, School of Public

Health Sciences, Faculty of Medicine, Public Health and Nursing at Gadjah Mada University No. KE/FK/449/EC.

Results

Based on previous business applications, information system features on an maternity hospital in Lampung–Indonesia were composed of 12 types of modules, which are installed to eight types of user groups. The menu types are listed in Figure 2. Based on the workflow model, access rights are allocated to each user in the working units. Information system application model utilization in the outpatient clinic by the end user includes the outpatient registration unit, poly/practice room, cashier, and pharmacy/medicine storage. Therefore, the workflow can be described as follows (Figure 2).

The workflow starts in the registration unit, when the patient arrives and shows his or her medical treatment card. It can be retrieved through the search feature by

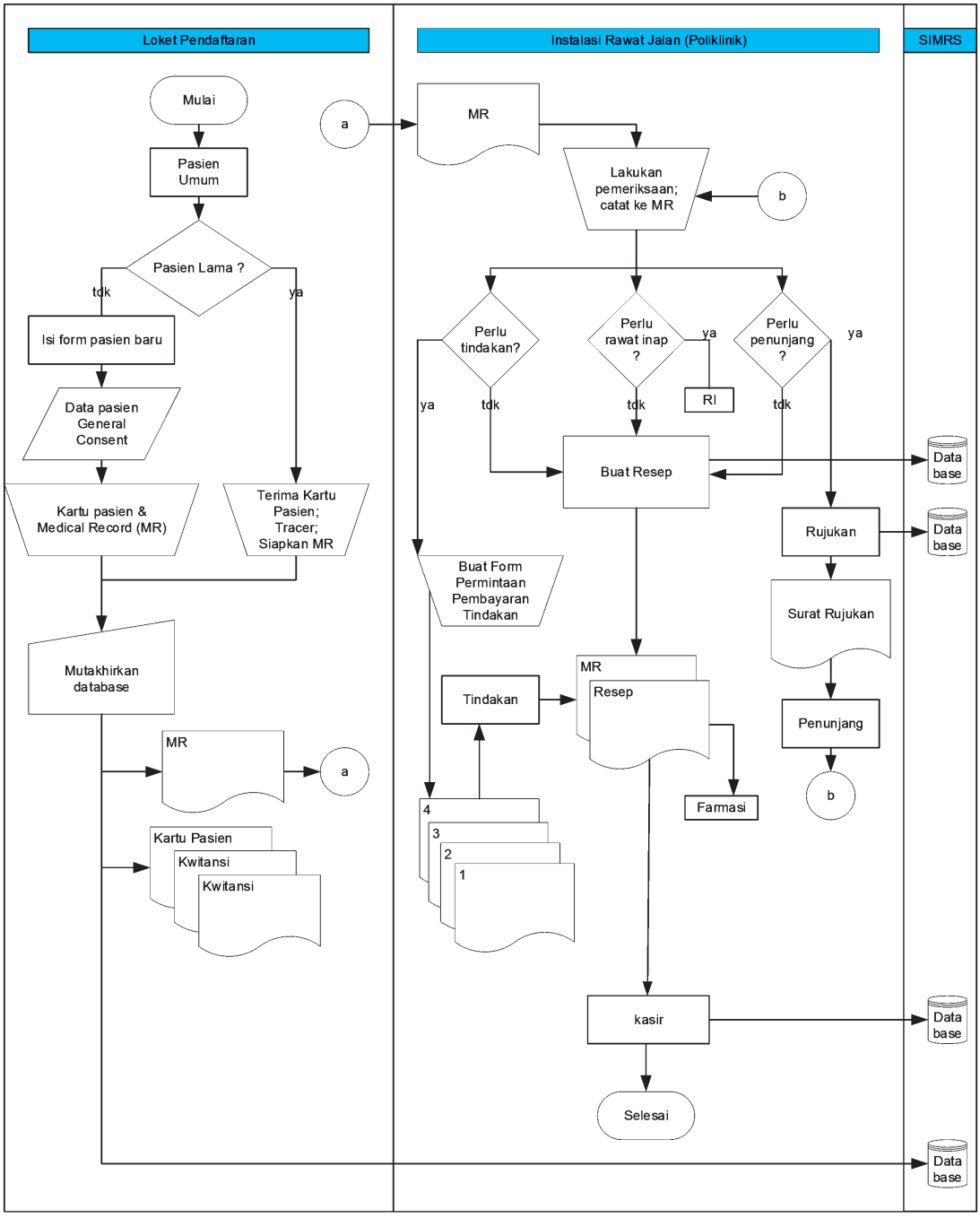


Figure 2. The Original Workflow of a Maternity Hospital in Lampung

Table 1. Findings of the Hospital Information System Problem in a Maternity Hospital

Outpatient Registration and Queue Dashboard Unit	Cashier Unit	Pharmacy/medicine Storage Unit	Poly/examination Room Unit
• On the menu where data are entered on patient demographics, specifically addresses, it would be nice if there was an address made up of the name of the village first, so that the subdistrict and district/city would be filled in automatically. Because a patient who made a registration generally memorizes the name of the village residence, it is very confusing especially the presence of area expansion. It would be worthwhile if the data entered into the system could all be printed directly, so there would no longer be a need to rewrite said data on the patient's medical treatment card. • There are inadequate officers who habitually use computers and no more staff information technology. Only two officers with nursing background input patients' data that know how the system works. So due to lack of staff, the cashiers themselves entry the registration. • The registration officer inputs the data after the patients go home. • The screen displayed in the dashboard (screen for the waiting-list patients) had a feature of small letters due to the small size of monitor. Then the transitional is too fast showing 10 number patients waiting room. It would be good if there was a sign to show the number of patients that were being examined in the examination room, so that the next patient in the waiting room knows they will be examined next. • A mistake when patients to the dashboard is the complaint from patients at which patients who make registration via telephone, often come late, so that the queue number is overlapped. There has been no standard procedure for an appropriate business process, whether the patient is immediately the next patient or he/she has to wait until the next three patients and then turn. • Search on the name of patients who forget to carry the medical treatment card is taken because the users often do not know, as a result, patients can have two number of the same patient.	• The main problem is the slow rate of data transfer from a computer in the examination room to one in the cashier room, so that the cashier must calculate the price of medication manually. • Often receiving that recipe wrong and late, so that it should be confirmed to the examination room. • When calculating the cost of each therapy and medication, the cashier cashier must round up each unit cost to thousands, so the calculation must still be done manually. • The cashier improvised by replacing that recipe entered from the examination room match them to medicine inventory. It would be better if there are information systems applying CDS as an alert of medicine prescription.	• Pharmacy unit has the same obstacles with the cashier unit, including the slowness of medicine data transmission prescribed from examination room. As a result, it still uses manual prescription from the cashier in the provision of the medicines. • Loading about drug inventory list in forms of available types of medicines and their price, the implementation now for users is limited to listing new names of medicines and their price.	• Nurses often input data instead of doctors, resulting in errors in the prescription. • There is often human error, such as when the nurse accidentally makes the wrong click while inputing data; as a result, errors will appear on the patient's dashboard.

entering keywords (patient's number, patient's name, husband's name, etc.). Some problems regarding the application features in each unit in the outpatient polyclinic in a maternity hospital in Lampung can be described as follows (Table 1).

Discussion

Application model utilization was not as perfect as the one that has been composed to be applied in each unit. The application model provided to every outpatient service unit was not optimally used. One application model was not used once by the users, and the reason given was ignorance of the application model as an information system feature. In general that module had not yet once used, good on a cashier until in units of pharmacies/warehouse medicine, was the report. Therefore, no information was produced from the data input into information system that were running. In addition, to report module, print module can do that. Moreover, in each unit, a printer was provided, whose function it was to print data by using the module. The printers' seals had not yet been broken because they had never been used. On the other hand, suppose in registration unit, in hope that the officer had to put in the data once in the computer, and the data could be printed as health care card form if the patient was registering.

The unwillingness of unknowing users is strongly affected by the lack of competent staff, particularly the absence of any more it staff in addition to the lack of mentoring from a vendor at the time of initial implementation.[9] The educational background of the officers was also a significant influence on habits regarding the use of computer technology. A previous study reported that among the officers with college-level education were

officers who only graduated highschool.[3]

In addition, the HIS met many obstacles to implementation.[10–12] All maternity hospital in Lampung units agreed that data transmission from one unit to the other was slow, so that the other unit, which is obstructed manually, finished the job. Suppose there was only a data transmission receipt and therapy that must be paid for by the patient from space check into cash. As a result, the cashier should count again manually based on the list price of a who taped to the counter by using a calculator. Not to mention, when prescription drugs prescribed for space check were unavailable in the hospital's drug inventory. Finally, the cashier asked the specialist doctor to replace the type of medicines that were prescribed. This kind of misconduct might be crucial, because the principle function of an information system is not to hinder but to support the work of health care services.[13]

A unit cashier is an indispensable unit in the outpatient service,[14,15] including in an maternity hospital in Lampung. This is because the cashier has multiple function, such as to receive the invoice from the examination room, to review the contents of prescription drugs given and determine if there is drug inventory/pharmacies, to record the price, and to send a prescription to the pharmacy.[16] At certain times, when there are no officers in the registration unit, the officers must perform double duty (so the end user has double rights), as a cash unit and as a registration unit. For this, the unit cashier is required to know equation the effects of the types of a drug that equal and that is in inventory pharmaceutical warehouses, in addition, to take care of registration patients. As a result of the risk of error prescription very vulnerable to, remember function cashier last as the decision makers that recipe sometimes not doing confirmation at the doctor a specialist in the unit of space check concerned with the drug prescribed in patients.

The provision of prescriptions by unit pharmacies, it can be said less regard again that recipe written or displayed system of the unit of space check and units cash. In addition to the slowness of the last data transmission system, especially the unit pharmacies as a unit end in the service outpatient waiting for transmission of the unit of practices and cashier units, in which a possible change in the prescription in cashier unit, finally has to wait longer. As a result, in the provision of prescription, pharmacies officers see enough prescription manual given by the cashier unit, and when the prescribed last until in the hands of patients, display data transmission the recipe from the new system appears. Thus, it only became a kind of comparison for a prescription manual given. In other words, the information system in the unit was actually ineffectual.

An error actually originally occurred in the unit poly/examination room, in which the prescription given by specialist physicians was not supported by drug inventory in pharmaceutical warehouses. Often, an assistant to the specialist physician (physicians commonly act as nurses) makes mistakes in inputting the therapy and medicines prescribed. Human error due to the lack of interface features that provide conformity application by medicine inventory is accused of being the root of existing problems in the polyclinic outpatient,[17,18] including in this study setting. Hence, the application of conformity features in support of a work niche is important for flagging errors.[19,20]

The principal problem was that there were no interface features that cross-reference the prescribed medicine with the medicine inventory available in the outpatient polyclinic in this maternity hospital in Lampung. This problem occured in the examination room unit with the medicine storage unit. The main problem was the slow transition of prescribing, which was troublesome for the existing workflows.

Conclusion

The TAM framework revealed that the user's perception of the real benefit of the current information system cannot be felt optimally (perceived usefulness). Yet, the user is still optimistic and aware of the benefits of the information system in supporting a faster and more efficient workflow (perceived of ease of use). The firmness of the higher management commitment, so that the user will implement the current information system in outpatient polyclinic and started to develop the potential initiative of the information system development in the outpatient poly.

Acknowledgment

This study was funded by Sisfomedika Co. Ltd. project in the Health Management and Information System Concentration, Faculty of Medicine, Public Health and Nursing, Gadjah Mada University. We thank to various parties namely: Adiharsa Winahyu, MIT, MPH and all directors and staff of a maternity hospital in Lampung. We also thank contributors that are Mr. Anis Fuad, Dr. Lutfan Lazuardi, and Mr. Guardian Yoki Sanjaya.

References

1. Ologeanu-Taddei R, Morquin D, Domingo H, Bourret R. Understanding the acceptance factors of an hospital information system: evidence from a French University Hospital. AMIA. Annu Symp Proceedings AMIA Symp. 2015: 1001–7.
2. AIHW. Review and evaluation of Australian information about primary health care. Melbourne: AIHW; 2011. p. 256.
3. Asyary A, Kusnanto H, Fuad A. Sistem peresepan elektronik pada keselamatan pengobatan pasien. Kesmas: National Public Health Journal.

2013; 8(3): 119–24.

4. Hwang JY, Kim KY, Lee KH. Factors that influence the acceptance of telemetry by emergency medical technicians in ambulances: an application of the extended technology acceptance model. Telemedicine Journal and e-Health. 2014; 20(12): 1127–34.
5. Garavand A, Mohseni M, Asadi H, Etemadi M, Moradi-Joo M, Moosavi A. Factors influencing the adoption of health information technologies: a systematic review. Electron Physician. 2016; 8(8): 2713–8.
6. Aggelidis VP, Chatzoglou PD. Using a modified technology acceptance model in hospitals. International Journal of Medical Informatics. 2009; 78(2): 115–26.
7. Gagnon MP, Orruno E, Asua J, Abdeljelil A Ben, Emparanza J. Using a modified technology acceptance model to evaluate healthcare professionals' adoption of a new telemonitoring system. Telemedicine Journal and e-Health. 2012; 18(1): 54–9.
8. Gemala RH. Pedoman pengelolaan rekam medis rumah sakit di Indonesia. Jakarta: Direktor Jendral Pelayanan Medik Departemen Keehatan Republik Indonesia; 2010.
9. Veruswati M, Asyary A. Implementation of information system toward health system strengthening in Indonesia: a policy brief. Public Health Indonesia. 2017; 3(3): 73–6.
10. Kilsdonk E, Peute LW, Jaspers MWM. Factors influencing implementation success of guideline-based clinical decision support systems: a systematic review and gaps analysis. International Journal of Medical Informatics. 2017; 98: 56–64.
11. Sligo J, Gauld R, Roberts V, Villa L. A literature review for large-scale health information system project planning, implementation and evaluation. International Journal of Medical Informatics. 2017; 97: 86–97.
12. Cresswell KM, Mozaffar H, Lee L, Williams R, Sheikh A. Workarounds to hospital electronic prescribing systems: a qualitative study in English hospitals. BMJ Quality & Safety. 2017; 26(7): 542–51.
13. Handayani PW, Hidayanto AN, Pinem AA, Hapsari IC, Sandhyaduhita PI, Budi I. Acceptance model of a hospital information system. International Journal of Medical Informatics. 2017; 99: 11–28.
14. Michael GC, Aliyu I, Grema BA, Thacher TD. Impact of structural and interpersonal components of health care on user satisfaction with services of an outpatient clinic of a Nigerian tertiary hospital. Tropical Journal of Medical Research. 2017; 20(2): 139.
15. Lu C-C, Lin S-W, Chen H-J, Ying K-C. Optimal allocation of cashiers and pharmacists in large hospitals: a point-wise fluid-based dynamic queueing network approach. IEEE Access. 2017; 6: 2859–70.
16. Herman MJ, Handayani RS, Siahaan SA. Kajian praktik kefarmasian apoteker pada tatanan rumah sakit. Kesmas: National Public Health Journal. 2013; 7(8): 365–72.
17. Chana N, Porat T, Whittlesea C, Delaney B. Improving specialist drug prescribing in primary care using task and error analysis: an observational study. The British Journal of General Practice. 2017; 67(656): e157–67.
18. Miller Jr DP, Latulipe C, Melius KA, Quandt SA, Arcury TA. Primary care providers' views of patient portals: interview study of perceived benefits and consequences. Journal of Medical Internet Research. 2016; 18(1): e8.
19. Jin Y, Yan M. Computer literacy and the construct validity of a high-stakes computer-based writing assessment. Language Assessment Quarterly. 2017; 14(2): 101–19.
20. Tsai HS, Shillair R, Cotten SR. Social support and "playing around" an examination of how older adults acquire digital literacy with tablet computers. Journal of Applied Gerontology. 2017; 36(1): 29–55.

Navarro *et al. Kesmas: National Public Health Journal*. 2019; 14 (2): 82-87
DOI: 10.21109/kesmas.v14i2.3111

Knowledge, Attitude, Practices, and Health Beliefs of Pregnant Women about Urinary Tract Infection and Its Associated Risk Factors: A Local Filipino Community Experience

Annalyn Navarro[1,2*], Raphael Enrique Tiongco[2], Reynaldo Bundalian Jr.[1,3]

[1]Public Health Program, Graduate School, Angeles University Foundation, Philippines, [2]College of Allied Medical Professions, Angeles University Foundation, Philippines, [3]Center for Research and Development, Angeles University Foundation, Philippines

Abstract

Urinary tract infection (UTI) during pregnancy is assumed to be associated with increased maternal and fetal morbidity and mortality; hence, a proper assessment of knowledge and practices is crucial to formulate preventive strategies to ensure the health of both the mother and the baby. The study determined the knowledge, attitude, practices (KAP), and the beliefs of pregnant women about UTI based on the Health Belief Model. A survey questionnaire was used to gather data from pregnant women with and without UTI. The association of the pregnant women's sociodemographic characteristics with their KAP and health beliefs was determined using Pearson's chi-square test. Results of the study showed that the majority of pregnant women have unsatisfactory knowledge with a positive attitude and good hygienic practices against UTI. Educational qualification and socioeconomic status showed a significant association with the KAP of pregnant women. Positive attitude and satisfactory hygienic practices were evident among the respondents despite their unsatisfactory knowledge. The salient traits of the Filipino women are exhibited on the descriptive of the Health Belief Model that include being resilient amid a problem and considering difficulties not as barriers but opportunities to make life healthier and better.

Keywords: Attitude, health belief model, knowledge, practices, urinary tract infection

Introduction

Urinary tract infection (UTI) during pregnancy is related to increased risks of maternal and fetal mortality and morbidity, even if the infection is asymptomatic. The high rates of UTI in pregnancy also show high rates of preterm birth and fetal mortality. The mapping of UTI rates in pregnant women across different countries clearly shows that it is a global happening with median rates of 3% - 35%.[1] Women are likely to experience UTI than men, because of their short anatomical urethra, which provides easy access to the normal flora from the vagina to the rectum.[2] The moist periurethral areas, where bacteria grow, contribute to a higher urinary colonization rate.[3] About one in five women would have UTI in their lifetime.[2] Women would experience UTIs 10 times more often than men.

Although everyone is vulnerable to UTI, some subpopulations are particularly at high risk, including pregnant women.[3] The anatomical and hormonal changes that pregnant women experience make them more susceptible to develop UTIs.[4] Pregnancy is one of the risk factors of UTI, considering the weight of the growing fetus in the uterus that causes urinary stasis and ureter vesical reflux.[5,6]

The presence of risk factors increases the chances of UTI. It is recommended that clinicians should regularly examine people with risk factors. They should be promptly treated, and the risk factors should be avoided and treated to prevent the development of recurrent UTI. Considering that pregnancy is a risk factor for UTI plus many others and its complications to both the mother and fetus, this study determined the knowledge, attitude, practices (KAP), and health beliefs of pregnant women about UTI. This study provides baseline data that may be

How to Cite: Navarro A, Tiongco RE, Bundalian R. Knowledge, attitude, practices, and health beliefs of pregnant women about urinary tract infection and its associated risk factors: a local Filipino community experience. Kesmas: National Public Health Journal. 2019; 14 (2): 82-87. (doi: 10.21109/kesmas.v14i2.3111)

Correspondence: Annalyn Navarro, DrPH, College of Allied Medical Professions, Angeles University Foundation, Angeles City, 2009, Philippines, Phone: (+63) (045) 625-2888 local 1710, E-mail: navarro.annalyn@auf.edu.ph*

Received : May 12th 2019
Revised : May 20th 2019
Accepted : July 23rd 2019

used as a basis in the implementation of a health education intervention that would provide pregnant women with better knowledge, positive attitude, good hygienic practices, and strong beliefs necessary in the prevention of UTI.

Method

This study used an analytic cross-sectional design that examined the KAP and beliefs of pregnant women about UTI based on the Health Belief Model (HBM) constructs. The prevalence of UTI among pregnant women was identified. Correlational analysis was also used to determine the association between the sociodemographic factors and the prevalence of UTI and the KAP of pregnant women. The sample size was calculated using Raosoft sample size calculator (Raosoft Inc., USA) at 95% confidence interval and 5% margin of error. The population size input of 45,802 was based on the total number of eligible pregnant women with at least four prenatal visits in Pampanga, the Philippines, as reported in the Field Health Information System in 2015. A total of 345 pregnant women were included as the target population of the study.

Participants of the study were pregnant women regardless of their gestation age, parity, gravidity, and age. Initially, arrangements were made with the administrative staff of health centers and district hospital to conduct the study during "buntis day," which is held once a month. The "buntis day" is an initiative of the local government wherein once a month regular check-ups and seminars are being provided to pregnant women. Recruitment of participants was made every week until the target population size was achieved. A structured questionnaire was developed, adapting significant items from the previous studies that investigated pregnant women with UTI.[5,7,8] The questionnaire was translated into the Filipino language for easy understanding of the target respondents. The questionnaire consisted of five parts. The first part contained questions about the sociodemographic profile of the respondents. The second part involved questions about their knowledge of the basic information on UTI and attitude UTI prevention. The third part covered their health practices, including self-hygiene, clothing manners, urination habits, and sexual activity. The fourth part consisted of questions on health beliefs based on HBM constructs that are perceived susceptibility, perceived severity, perceived barriers, perceived benefits, cues to action, and self-efficacy.

Collected data were encoded using Microsoft Excel, and the encoded data were then verified and analyzed using STATA IC Ver. 13.0. Frequency distribution, percentage, and mean were used to represent the prevalence of UTI and the various variables in the study, namely, the sociodemographic profile, KAP, and the HBM constructs, with weighted data scoring scheme. The association of sociodemographic profile with the occurrence of UTI and baseline KAP of the participants was determined with Pearson's chi-square test, which was later verified with structural equation modeling.

The Angeles University Foundation - Center for Research and Development Ethics Review Committee (Ref No. 028) approved to conduct the study. Parental consent was sought for participants below 18 years of age. The objectives of the study and the contents of the informed consent/parental consent were explained to the respondents. The study only included those who signified their willingness to participate by signing the form. A total of 24 visits to different rural health units (RHUs) and district hospital from August 2017 to October 2017 were done to gather the data for the total population required. Technical support and instructions were provided to the pregnant women on proper specimen collection for urinalysis. Standard urinalysis was performed in either the health centers or hospital laboratory where the respondents were recruited. The UTI diagnosis was confirmed by the doctors of the health centers and hospital based on the urinalysis and medical examination results, as part of the routine procedures during prenatal check-ups.

Results

A total of 345 pregnant women from different RHUs and district hospital in Pampanga, the Philippines, were recruited to participate in the study. The prevalence rate observed among pregnant women was 35.94% (124/345). Table 1 shows the sociodemographic characteristics of the respondents, who tested positive and negative for UTI based on the diagnostic procedure of the rural health centers and district hospital covered in the study. It also shows the results of the association test of the sociodemographic variables with the occurrence of UTI among pregnant women significant at p-value < 0.05.

The study revealed that UTIs were most common among pregnant women who were 18 to 24 years old (49.20%). The majority of them lived with partners (62.10%) and were high school graduates (73.39%). Of those with UTI, the majority (83.90%) were housewives, belonged to the poor economic status (76.00%), were in their third trimester of gestation (51.61%), were in their second to third pregnancies (45.97%), and had more than one child (40.70%). Among all the sociodemographic factors, educational attainment is almost significantly associated with UTI during pregnancy with a p-value of 0.06. Table 2 shows the description of the KAP (personal hygiene) of pregnant women about UTI. A frequency of 267 (77.39%) indicates that most of the

Table 1. Sociodemographic Profile and Association with the Occurrence of Urinary Tract Infection among Pregnant Women

Variables	Category	n = 345		Negative UTI n = 221		Positive UTI n = 124		p-Value
		F	%	F	%	F	%	
Age (years)	< 18	27	16.26	9	3.57	18	14.75	0.24
	18–24	139	40.76	130	51.58	42	34.44	
	25–30	101	29.62	60	23.81	41	33.60	
	> 30	74	21.70	53	21.03	21	17.21	
Civil status	Single	34	9.88	24	10.91	10	8.10	0.09
	Married	119	34.59	85	38.60	34	27.40	
	Separated	6	1.74	3	1.40	3	2.40	
	Live-in	185	53.78	108	49.10	77	62.10	
Educational attainment	Elementary school	39	11.34	31	14.10	8	6.45	0.04*
	High school	230	66.86	139	63.20	91	73.39	
	Higher education	74	21.51	50	22.70	24	19.35	
	None	1	0.29	0	0.00	1	0.81	
Work	Employed/self-employed	47	13.74	27	12.40	20	16.10	0.33
	Housewife	295	86.26	191	87.60	104	83.90	
Socio-economic status	Low income (poor)	251	77.71	163	78.74	88	76.00	0.55
	Middle income	72	22.29	44	21.26	28	24.00	
	Upper income	0	0.00	0	0.00	0	0.00	
Age of gestation (weeks)	< 12 (first trimester)	23	6.74	14	15.38	9	14.06	0.17
	< 28 (second trimester)	163	47.80	112	51.61	51	41.13	
	≥ 28 (third trimester)	155	45.45	91	41.94	64	51.61	
Gravidity	First	125	36.55	78	35.78	47	37.90	0.48
	Second and third	150	43.86	93	42.66	57	45.97	
	Fourth +	67	19.59	47	21.56	20	16.13	
Parity	0	129	37.94	80	36.90	49	39.80	0.33
	1	82	24.12	58	26.70	24	19.50	
	> 1	129	37.94	79	36.40	50	40.70	

Notes: UTI= urinary tract infection

Table 2. Knowledge, Attitude, and Practices of Pregnant Women about Urinary Tract Infection

Variable	Category	Frequency (n = 345)	Percentage %
Knowledge	Unsatisfactory	267	77.39
	Satisfactory	76	22.03
Attitude	Negative	16	4.64
	Positive	324	93.91
Preventive practices (personal hygiene)	Poor hygiene practices	4	1.16
	Satisfactory hygiene practices	332	96.23

respondents had unsatisfactory knowledge of UTI. Almost all of the respondents (324; 93.91%) had a positive attitude regarding the prevention of UTI during pregnancy. The majority of the respondents with a frequency of 332 (96.23%) were described to have satisfactory hygienic practices against UTI (Table 2).

The six constructs, namely, perceived susceptibility, perceived severity, perceived benefits, perceived barrier, cues to action, and self-efficacy, are presented in Table 3 with corresponding statements that were rated the highest by respondents, except for perceived barrier (lowest mean), using a Likert scale. As for perceived susceptibility, pregnant women believed that they are prone to UTI and that they had a high likelihood of having the disease because of their present condition with the highest weighted mean of 3.16. The majority of the respondents agreed that UTI could lead to kidney damage as part of the perceived severity with the highest weighted mean of 3.34. The regular prenatal checkup was the most important among the statements related to perceived benefits with the highest weighted mean of 3.74 as perceived by the respondents.

The majority of the respondents disagreed with the presented statements related to the perceived barrier, indicating that they did not perceive these given situations as barriers to UTI prevention, with the least weighted mean of 1.99 on having to observe good personal hygiene before and after intercourse. For cues to action, respondents strongly agreed that they were most willing to do all necessary actions to prevent UTI with the highest weighted mean of 3.74 on "always follow the advice of the doctor and observance of good personal hygiene." The weighted mean in self-efficacy indicated that the respondents were confident in their capacity to practice healthy behaviors for a healthy pregnancy and a healthy baby with the highest weighted mean of 3.44.

Table 4 shows the association of the sociodemographic variables with knowledge, attitude, and preventive practices (personal hygiene) of pregnant women. This is to present if the demographics have to do with the level of KAP of the pregnant women regarding UTI. Among the sociodemographic factors, educational attainment and socioeconomic status were found to have

Table 3. Descriptive of the Health Beliefs with the Highest Weighted Mean Based on Health Belief Model Constructs of the Pregnant Women

Health Belief Model Construct		Strongly Agree	Agree	Disagree	Strongly Disagree	Mean	Interpretation
		n (%)	n (%)	n (%)	n (%)		
Perceived susceptibility	I worry a lot about getting UTI	129 (38.28)	152 (45.10)	39 (11.57)	17 (5.04)	3.16	Agree
Perceived severity	Having UTI can lead to kidney damage	155 (45.99)	150 (44.51)	24 (7.12)	8 (2.37)	3.34	Agree
Perceived benefits	Regular prenatal checkup can help prevent UTI and its complications	257 (76.49)	74 (22.02)	2 (0.60)	3 (0.89)	3.74	Strongly agree
Perceived barriers*	It is very tiring to wash sexual organ before and after intercourse	27 (8.04)	36 (10.71)	180 (53.57)	93 (27.68)	1.99*	Disagree
Cues to action	I always follow the advice of the doctor	241 (71.73)	91 (27.08)	3 (0.89)	1 (0.30)	3.70	Strongly agree
	I observe good personal hygiene like proper washing to prevent UTI	240 (71.43)	92 (27.38)	4 (1.19)	0	3.70	Strongly agree
Self-efficacy	I know that my baby will be healthy upon delivery	171 (50.89)	145 (43.15)	17 (5.06)	3 (0.89)	3.44	Agree

Notes: *Lowest weighted mean

Table 4. Association of Sociodemographic Variables with Knowledge, Attitude, and Practices

Variables	Knowledge	Attitude	Practices
	(p-Value)	(p-Value)	(p-Value)
Age	0.04*	0.51	0.98
Civil status	0.18	0.36	0.78
Educational attainment	<0.001*	0.20	0.57
Work	0.57	0.10	0.42
Age of gestation	0.53	0.78	0.47
Gravidity	0.95	0.87	0.15
Parity	0.44	0.77	0.53
Socio-economic status	<0.001*	0.46	0.89

Notes: p-value significant at < 0.05

a significant association with the knowledge of the respondents (p-value < 0.001). None of the other sociodemographic variables showed an association with the attitude and practices of pregnant women.

Discussion

A prevalence rate of 35.94% (124/345) showed positive UTI among pregnant women, which is comparable with a local study done in Barangay Cubacub Health Center in Mandaue, Cebu City, Philippines, among first-time pregnant women in their first trimester with an occurrence rate of 35%.[9] The high prevalence rate is consistent with the global trend, with median rates between 3% and 35%. The prevalence rate of UTI among pregnant women in the current study was high, considering that it was in the higher range limit of 35% based on the study done by Gilbert *et al.*[1]

Most of the pregnant women included in the study were housewives aged between 18 and 24 years and were those with the highest prevalence of UTI among the age groups. It is noteworthy to mention that the youngest pregnant woman covered in the study was 12 years old, and the percentage of respondents aged 18 years old and below was 16.26%. There was a shallow frequency of the respondents with 12 weeks of gestation covered in the study, showing that pregnant women would not submit themselves to prenatal check-ups as early as the first trimester of pregnancy. More than half of the respondents (53%) were with live-in partners, a variable that most related studies did not cover. The sociodemographic profile of the respondents in the current study is consistent with the 2013 National Demographic and Health Survey report regarding early pregnancy and motherhood with low elementary education and in the lowest wealth status among Filipino women. The report also indicated that the initiation of a sexual act before the age of 18 years among young women was more common in those with less education and those from poorer households.[10]

None of the sociodemographic variables showed a significant association with the occurrence of UTI among pregnant women; however, educational attainment showed an almost significant association with a p-value of 0.057. The current study showed that sociodemographic profile had nothing to do with UTI as most studies would report. UTIs are commonly seen among pregnant women with the same sociodemographic variables as with age, education, and socio-economic level in the studies of Sadeghi *et al.*,[7] and Emiru *et al.*,[5] but discordant with other variables like gravidity (first pregnancy) and parity (no child) in the study of Dimetry *et al.*[11]

Sociodemographic variables like age, education, employment status, and gravidity did not show significant association with the prevalence of UTI similar to the results of the current study; however, health behaviors like clothing manners, eating patterns, urinating habits,

and cleaning and sexual behaviors were found to have a significant association with urinary infection.[6,8] In the current study, the association of hygienic practices and prevalence of UTI was not covered.

The majority of the respondents had unsatisfactory knowledge of UTI with a positive attitude and satisfactory hygienic practices regarding the prevention of UTI during pregnancy. A local study on the awareness level and occurrence rate of UTI among pregnant women showed a significant association. The awareness level on UTI's definition was high, causes moderate, risk factors moderate, symptoms high, and prevention high.[9] A study on the prevention of genitourinary tract infection (GUTI) of female adolescent students revealed the same results with the current study, with unsatisfactory know ledge on the necessary information on GUTI, including its causes, symptoms, and complications.[12] Another study, conducted among 110 pregnant women in Behbahan City in Iran, revealed that the knowledge, attitude, and health behavior in the prevention of UTI were moderate in the description.[13] The unsatisfactory knowledge of the respondents is likely because of their low level of education. The questions regarding knowledge are highly facts based and technical, which were not known to the majority of them.

The study revealed that the respondents had a positive attitude about learning more about UTI, which is a very appropriate description of their unsatisfactory knowledge. However, their satisfactory hygienic practices for UTI prevention did not align with their unsatisfactory knowledge. This finding might be due to the typical optimistic outlook in life of most Filipino people and their willingness to learn more about UTI and its prevention. Practices were described to be of satisfactory hygiene practices, which means that they might not know all the facts theoretically, but they are already practicing them.

The majority of the respondents perceived themselves to be susceptible to UTI, with kidney damage as the most severe complication. They believed that regular prenatal check-up was the most beneficial action to prevent UTI during pregnancy. They did not perceive the presented barriers as obstacles to preventive practices. The respondents are most willing to take action and are confident of healthy pregnancy despite their sensitivity to UTI. It was suggested that a qualitative exploration of perceived barriers be done based on a study among female college students for breast cancer screening. Similar to the current study, counseling was done to extract perceived barriers about UTI prevention, as variables listed in the survey questionnaire may not cover the minority population.[14] A total of 68 individuals underwent counseling, and 12 of them were husbands of pregnant women.

A percentage of 38% claimed that they did not experience any difficulty in following preventivepractices against UTI. Some of the noted barriers that inhibited them from following preventive practices like drinking adequate water were heavy household chores, stress in taking care of the other children, feeling bloated from so much drinking of water, non-availability and inaccessibility of water, and preference of flavored beverages than water because of taste. Others described that their diet contained processed food like chips and soda because these are readily available. Many pregnant women mentioned that their fruit consumption is very minimal because of the high cost. None of them indicated a barrier regarding personal hygiene like the washing of genitalia and sexual activity because perhaps these are sensitive issues, and they would not like to divulge some privacy issues. It is noteworthy to mention that some of the respondents directly addressed the barriers into a positive viewpoint and said that they needed to take care of themselves because their husband or partner was working abroad or far-flung areas. Otherwise, if they got sick, nobody would take care of them. Most of the related studies in HBM did not show the description of the individual constructs of the respondents.

The HBM constructs with the lowest weighted score was perceived barrier, and the one with the highest weighted score was cues to action, which vividly shows the resilience of typical Filipinos, in which many will remain to be positive and hopeful despite some obstacles and are determined to achieve their goals no matter how impossible they may seem.

Educational attainment and socioeconomic status were found to have a significant association with the unsatisfactory level of knowledge of the respondents. The majority of the respondents' low level of education contributed a lot to their unsatisfactory knowledge. Being poor, on the other hand, was a critical factor for the noncompletion of their education. The details about UTI covered in the survey tool in the knowledge part were highly fact based. The reason for the unsatisfactory scores in the knowledge part was likely due to a lack of formal schooling. None of the sociodemographic variables showed an association with the positive attitude and satisfactory hygienic practices of pregnant women. Considering that their sociodemographic profile is typical of the underprivileged, their positive attitude and satisfactory hygienic practices still placed them at an advantaged position. In a study conducted among women of low economic status about pregnancy-related risk factors, it was shown that despite the strong knowledge base, high risk behaviors and conditions existed. Knowledge alone is not enough to change behavior.[15]

In general, there is a high prevalence of UTI among pregnant women, consistent with global and local statistics, similar to the upper range limit of the global figures. The demographic profile of the respondents istypical of the underprivileged, with the majority of them having completed only high school education and belonging to the low socioeconomic status, which is considered poor. The respondents have a positive attitude and satisfactory hygienic practices on UTI prevention despite their unsatisfactory knowledge about UTI. Respondents' health beliefs based on the HBM constructs are outstanding and vividly depict the traits of the Filipino people of having an optimistic outlook on life despite the difficulty.

Conclusion

Considering the pregnant women's positive attitude and satisfactory hygienic practices about UTI prevention despite the unsatisfactory level of knowledge, it is recommended to regularly conduct a mother's class that includes a discussion on UTI and its causes, signs, symptoms, and complications. At present, a regular mother's class is being done in RHUs and district hospitals as part of the Department of Health's maternal and child care program. However, the class only typically includes topics such as the importance of attending prenatal and postnatal check-ups, birthing, breastfeeding, newborn screening, and promoting the department's programs. UTI and its prevention among pregnant women are not substantially covered in the mother's class.

References

1. Gilbert NM, O'brien VP, Hultgren S, Macones G, Lewis WG, Lewis AL. Urinary tract infection as a preventable cause of pregnancy complications: opportunities, challenges, and a global call to action. Global Advances in Health Medicine. 2013; 2: 59–69.
2. Mundt LA, Shanahan K. Textbook of urinalysis and body fluids. 2nd ed. Textbook of routine urinalysis and body fluids. Lippincott Williams & Wilkins; 2011. p 330.
3. Foxman B. Urinary tract infection syndromes. Occurrence, recurrence, bacteriology, risk factors, and disease burden. Infectious Disease Clinics of North America. Elsevier Inc; 2014. p. 1–13.
4. Hamdan HZ, Ziad AHM, Ali SK, Adam I. Epidemiology of urinary tract infections and antibiotics sensitivity among pregnant women at Khartoum North Hospital. Annals of Clinical Microbiology and Antimicrobials. 2011; 10: 2.
5. Emiru T, Beyene G, Tsegaye W, Melaku S. Associated risk factors of urinary tract infection among pregnant women at Felege Hiwot Referral Hospital, Bahir Dar, North West Ethiopia. BMC Reseach Notes. 2013; 6: 1.
6. Amiri FN, Rooshan MH, Ahmady MH, Soliamani MJ. Hygiene practices and sexual activity associated with urinary tract infection in pregnant women. East Mediterranean Health Journal. 2009; 15: 104–10.
7. Sadeghi EN, Taghdisi MH, Solh M. Effect of education based on health belief model on prevention of urinary infection in pregnant. HealthMED. 2012; 6: 4211–7.
8. Javaheri Tehrani F, Nikpour S, Haji Kazemi EA, Sanaie N, Shariat Panahi SA. The effect of education based on health belief model on health beliefs of women with urinary tract infection. International Journal Community Based Nursing & Midwifery [Internet]. 2014; 2: 2–11. Available from: http://www.ncbi.nlm.nih.gov/pubmed/25349840
9. Buensalida KJ, Neis R, Opay K, Raagas RF, Vidal PF, Zialcita M. The level of awareness and rate of occurrence of urinary tract infection among pregnant women in Barangay Cubacub, Mandaue City. Herdin Rec # R09-ZCHRD-13052413322660. 2012; 35.
10. Recide RS. Final results from the 2013 national demographic and health survey. 2014; 2013–4.
11. Dimetry SR, El-Tokhy HM, Abdo NM, Ebrahim MA. Urinary tract infection and adverse outcome of pregnancy. Journal of the Egypt Public Health Association. 2007; 82: 203–18.
12. Al-Kotb H, Elbahnasawy HT, El Nagar SA, Ghabyen NS. Prevention for genitourinary tract infection among female adolescents students. IOSR Journal of Nursing and Health Science. 2016; 05: 12–8.
13. Taghdisi MH, Nejadsadeghi E. Evaluation of knowledge, attitude and health behaviour of the pregnant women consulted in Behbahan Health Centers in the field of urinary infections based on the health belief model (hbm). Modern Care Journal. 2011; 8(3): 143-151.
14. Frankenfield KM. Health belief model of breast cancer screening for female college students. DigitalCommons@EMU. 2009.
15. Harelick L, Viola D, Tahara D. Preconception health of low socioeconomic status women: assessing knowledge and behaviors. Women's Heal Issues. 2011; 21: 272–6.

Meilani *et al. Kesmas: National Public Health Journal*. 2019; 14 (2): 88-94
DOI: 10.21109/kesmas.v14i2.2774

Midwife's Role in the Mother-to-Child Transmission Prevention Program in Primary Health Care in Yogyakarta

Niken Meilani[1]*, Nanik Setiyawati[1], Sammy Onyapidi Barasa[2]

[1]Poltekkes Kemenkes Yogyakarta, Indonesia, [2]Nursing Department, Kenya Medical Training College, Chuka Campus, Kenya, East Africa

Abstract

Curing and eradicating Human Immunodeficiency Virus (HIV)/Acquired Immunodeficiency Syndrome (AIDS) are to the core principles of the United Nations' Sustainable Development Goals (SDGs). The incidence of HIV in the world remains high. Although midwives play a pivotal role in PMTCT implementation, the factors associated with midwives' role in its implementation are not well understood. The aim of this study was to determine factors associated with midwives' role in implementation of PMTCT. This study used a cross-sectional design. The subjects were 80 midwives at 14 primary health care in Yogyakarta City, Indonesia. The study was conducted from April to August 2017. Data were analyzed through univariate, bivariate with chi-square and Fisher's exact test, multivariate with logistic regression. The results showed that 47.5% of midwives were in the poor category regarding implementation of PMTCT. Information availability through socialization (p-value = 0.047) and knowledge level (p-value = 0.016) were found to be related to PMTCT implementation. There was no relationship between age, length of work, education level, marital status, availability of information, midwife's attitude, perception of the availability of facilities and institutional support with midwife behavior in PMTCT implementation. Multivariate analysis showed that level of knowledge was the most dominant factor affecting PMTCT implementation (OR = 6.2; CI 95% = 1.8-21.4). We recommend that efforts should be made to continuously improve the knowledge of midwives on PMTCT implementation through peer support and training in order to achieve sustainable development goals.

Keywords: Human Immunodeficiency Virus, midwives, pregnant, prevention

Introduction

The impact of Human Immunodeficiency Virus (HIV), the virus that causes Acquired Immunodeficiency Syndrome (AIDS), is still a major global public health concern. For instance, as of 2018, nearly 37.9 million individuals were living with the virus. However, there are persistent renewed efforts and commitments to halt and reverse the HIV pandemic. This has been seen in efforts such as the Sustainable Development Goals (SDG-3) which aims at ensuring universal access to HIV prevention services and to end HIV as a global threat by the year 2030. In the year 2018 out of the 1.7 million new HIV infections reported worldwide, 160,000 of them were among children aged 0-14 years.[1]

According to the Indonesian AIDS Committee in 2015, only five people were known to be suffering from AIDS in Indonesia in 1987. However, the number of AIDS cases in 2007 had jumped significantly, up to 17,699 cases, and 3,586 died. HIV attacks the immune system and damages a subtype of white blood cells called T lymphocyte or T cells, resulting in immunodeficiency and ended with AIDS.[2,3]

In 2014 there were 501,400 cases of HIV/AIDS in Indonesia. People suffering from HIV/AIDS were spread throughout 32 provinces and 300 sub-regions/cities. The majority of people suffering from the disease were in the reproductive range of 15–29 years old. Today, the number of HIV/AIDS cases being reported in Indonesia is still just the tip of the iceberg. The estimated number of actual cases has reached 270,000 people and in Yogyakarta, and the incidence of HIV continues to rise annually.[2,4]

Vertical transmission (mother-to-child) is a major pathway for HIV infection in children. World Health

How to Cite: Meilani N, Setiyawati N, Barasa SO. Midwife's role in the mother-to-child transmission prevention program in primary health care in Yogyakarta. Kesmas: Public Health Journal. 2019; 14 (2): 88-94. (doi: 10.21109/kesmas.v14i2.2774)

Correspondence: Niken Meilani, Poltekkes Kemenkes Yogyakarta, Mangkuyudan MJ III Street No. 304, Yogyakarta, Indonesia, 55143, Phone: +6274-374331, E-mail: nikenbundaqueena@gmail.com*

Received : November 14th 2018
Revised : May 9th 2019
Accepted : July 15th 2019

Organization (WHO) has declared that without preventive interventions, 40% of babies born from infected mothers would themselves be infected. The focus of prevention is applied in three phases, namely pregnancy, labor, and breastfeeding. These three phases underscore the critical midwives role that play in Prevention of Mother-to-Child Transmission (PMTCT). Midwife's knowledge of HIV can be the basic foundation that influence people's attitude and behavior. However, there are still midwives with negative attitude and perception towards HIV/AIDS. Thus, it is paramount that it becomes part of their job to overcome HIV/AIDS with unique understanding and approach. Midwives' knowledge, attitude, and perception towards HIV are important determinants in overcoming the disease.[5,6]

A high coverage of HIV testing appears to be hampered by the failure of pregnant women to understand that testing is available. Good quality HIV pre-test information is central to ensuring that pregnant women know and accept reasons for testing and return to collect result, a prerequisite for those who positively tested to complete the program.[7]

This study aimed to describe how midwives in Mother and Children Health Clinics in the Primary Health Care implement the PMTCT program for pregnant women and factors influencing their role.

Method

This cross sectional quantitative study, covering 14 Puskesmas/primary health care conducted in Yogyakarta City from April to August 2017. All midwives working in primary health care in the Mother and Children Clinics were assessed. Only clinics already implementing the PMTCT program were involved. The primary health care was selected based on random sampling techniques towards all primary healthcare center in Yogyakarta. The sample size calculated were proportion with minimum sample size. There were 80 midwive respondents that were chosen through random sampling. Selected respondents were selected from a list from 14 primary health care midwives. Those who took part were provided a written consent to participate.

This study used the Precede–Proceed Model.[8] Independent variables consisted of the midwives' socio-demographic characteristics, such as age, marital status, education level, work experience, HIV information available through lectures and outreach in the workplace, midwives' knowledge of HIV and PMTCT, plus their attitudes toward its implementation. As predisposing factors, Midwives' perceptions about institutional support of the program were listed as reinforcing factors, and the facilities' availability to implement PMTCT was listed as enabling factor. The dependent variable was the midwives' role.

A self-administered questionnaire was used in this study. Midwives' knowledge was measured through multiple choice questions. True statements were scored as 1 and false statements were scored as 0. The scores were then classified into three categories to characterize the level of knowledge; including higher (>70%); satisfactory (56%–69%) and unsatisfactory (<56%). The study used a Likert scale to measure attitudes and categorized them as positive and negative based on the mean. The scoring was as follows: a positive statement Agree = 2, Disagree = 1, and Hesitant = 0. A negative statement Agree = 1, Disagree = 2 and Hesitant = 0. Level of perception used a visual analog scale scored from 0 to 10. Perception on institutional support was categorized as supporting and less supporting. Perception on facility availability and PMTCT behavior was categorized as good and poor.

Descriptive statistics using frequencies and percentage were used to describe findings. Chi-square test or Fisher's exact test was applied to determine relationships between dependent and independent variables. Logistic regression was applied for all variables with p-value ≤ 0.25 and to explain independent variables: midwives' socio-demographic characteristics (age, marital status, education, work experience, HIV information available through lectures and socialization in the workplace, midwives' knowledge of HIV and PMTCT, midwives' attitude to the implementation of PMTCT, midwives' perceptions on institutional support for the PMTCT program. The availability of facilities' for implementing PMTCT was strongly associated with the dependent variable that was the midwives' role in implementing the PMTCT.

Ethical clearance was obtained from the Ethical Committee Poltekkes Kemenkes Yogyakarta Number: LB.01.01/KE-01/XII/326/2017. A formal letter of permission for respondents included informed consent; they were informed that the data would be treated with utmost confidentiality.

Results

The study was conducted on 80 randomly selected midwives in 14 primary health care clinics in Yogyakarta City that were implementing the PMTCT program. The characteristics of the respondents are showed in Table 1.

Table 1 shows that the majority of midwives were younger than 28 years old (53.8%), had *Diploma* 3 education in midwifery (82.5%), were married (55%), and had worked for less than seven years (55%). The main source of HIV information among respondents was via college lectures (72.5%).

Independent variables in line with the Precede-Proceed Model of health program planning and evaluation by L. W. Green were midwives' knowledge

Table 1. Distribution of Respondent's Characteristics

Characteristic	Category	Amount (n = 80)	Percentage (%)
Age	> 28 years old	37	46.2
	< 28 years old	43	53.8
Marital status	Married	44	55.0
	Single	32	40.0
	Widow	4	5.0
Education	Midwifery subject *D1*	4	5.0
	Midwifery subject *D3*	66	82.5
	Midwifery subject *D4/S1/S2*	10	12.5
Work experience	> 7 years	36	45.0
	< 7 years	44	55.0
Information availability about HIV	through lectures	58	72.5
	through socialization in the workplace	4	5.0

Notes: HIV = Human Immunodeficiency Virus, D1 = *Diploma* 1 degree, D2 = *Diploma* 2 degree, D3 = *Diploma* 3 degree, S1 = Bachelor degree, S2 = Master's degree

Table 2. Midwives' Knowledge Level, Attitude, Perception and Behavior in Implementing Prevention of Mother-to-Child Transmission

Characteristic	Category	Number of Midwives (n = 80)	Percentage (%)
Knowledge level	Higher	8	10.0
	Satisfactory	32	40.0
	Unsatisfactory	40	50.0
Midwives' attitudes toward PMTCT	Positive	30	37.5
	Negative	50	62.5
Perception on institutional support	Supporting	36	45.0
	Less supporting	44	55.0
Perception on facility availability	Good	43	53.8
	Poor	37	46.2
Midwives' role in implementing PMTCT	Good	42	52.5
	Poor	38	47.5

Note: PMTCT = Prevention of Mother-to-Child Transmission

level, attitude, perception, experience and roles in implementing PMTCT as seen in Table 2. It showed that majority of midwives' knowledge was categorized as unsatisfactory (50%). Most respondents had negative attitudes toward PMTCT (62.5%) and perceived that the institutions where they worked were unsupportive of their efforts to implement PMTCT (55%). Majority believed that there were enough institutional facilities to implement PMTCT (53.8%) and a similar majority (52.5%) held positive attitudes to PMTCT.

Bivariate analysis was used to analyze association between independent and dependent variables (Table 3). Table 3 shows that midwives > 28 years old mostly implemented PMTCT in the poor category (51.4%), while those aged < 28 years old mostly (55.8%) ranked as Good. Statistically, this variable significance, with only a p-value of 0.678. Midwives who worked more than 7 years scored in the 50% category of PMTCT implementation, while those who worked less than 7 years were mostly "unsatisfactory." However this variable was also statistically insignificant, at p-value = 0.857.

Midwives with one year of midwifery education (*Diploma 1*) scored at 50%, in between those who scored good and poor. Respondent with three years of midwifery education (*Diploma 3*) implemented PMTCT in the unsatisfactory range (51.5%). Midwives with undergraduate midwifery degrees (*Diploma 4*), or more, mostly implemented PMTCT in a good category (80%). Statistically, this variable was insignificant, with p-value = 0.156.

Married midwives mostly implemented PMTCT in the unsatisfactory category (59.1%), while single and widowed midwives implemented PMTCT in a good category (65.6% and 75%). This variable, was not statistically meaningful, at p-value = 0.064. Most respondents claimed that they never received information about PMTCT provided in their workplace. This variable was statistically significant (p-value = 0.047). For knowledge level variable, most respondents (71.9%) with satisfactory knowledge, implemented PMTCT in the good category, while those with unsatisfactory knowledge levels tended to implement PMTCT in the below average or not good enough categories (60%). This variable was statistically significant (p-value = 0.016).

Table 3. The Relationship Between Midwife Characteristics, Knowledge Level, Attitude, Perception about HIV/AIDS vs. Their Role in Implementing Prevention of Mother-to-Child Transmission

Variable	Category	Implementation of PMTCT						p-Value
		Good		Poor		Total		
		n = 42	%	n = 38	%	n = 80	%	
Age (years)	> 28	18	48.6	19	51.4	37	100	0.678*
	< 28	24	55.8	19	44.2	43	100	
Work experience	> 7 years	18	50.0	18	50.0	36	100	0.857*
	< 7 years	24	54.5	20	45.5	44	100	
Education Level	*D1* Midwifery	2	50.0	2	50.0	4	100	0.156*
	D3 Midwifery	32	48.5	34	51.5	66	100	
	D4/S1/S2	8	80.0	2	4.8	10	100	
Marital Status	Married	18	40.9	26	59.1	44	100	0.064*
	Unmarried	21	65.6	11	34.4	32	100	
	Widow	3	75.0	1	25.0	4	100	
Information available through socialization	Yes	0	0	4	100	4	100	0.047*
	No	42	55.5	34	44.7	76	100	
Information available through lectures	Yes	29	50.0	29	50.0	22	100	0.634
	No	13	59.1	9	40.9	58	100	
Knowledge level	Higher	3	37.5	5	62.5	8	100	0.016*
	Satisfactory	23	71.9	9	28.1	32	100	
	Unsatisfactory	16	40.0	24	60.0	40	100	
Attitude toward HIV/AIDS	Positive	16	53.3	14	46.7	30	100	1.000
	Negative	26	52.0	24	48.0	50	100	
Perception on facility	Good	26	60.5	17	39.4	43	100	0.189
	Poor	16	43.2	21	56.8	37	100	
Perception on institutional support	Good	19	52.8	17	47.2	36	100	1.000
	Poor	23	52.3	21	47.7	44	100	

*used Fisher's exact test

Note: PMTCT (Prevention Mother-to-Child Transmission), D1 Midwifery = *Diploma 1* Midwifery, D3 Midwifery = *Diploma 3 Midwifery,* D4 = *Diploma* 4 degree, S1 = Bachelor degree, S2 = Master's degree S1 = Bachelor degree, S2 = Master's degree

The attitude variable included both those with positive and negative attitudes about implementing PMTCT, scored in the good category, yet this variable was not statistically significant (p-value = 1.000). For perception variable on the most respondent facilities, those with good perception (60.5%) tended to implement PMTCT in the good category, while those with poor perception (56.8%), implemented PMTCT in the poor category. This variable was statistically insignificant (p-value = 0.189).

Perception variable on institutional support showed that respondents who perceived institutions as good or poor implemented PMTCT in the good category. This variable was not statistically significant (p-value = 1.000). Bivariate analysis, concluded that the independent variables which statistically related to midwives' role in implementing PMTCT were knowledge level and information availability through socialization in the workplace.

Multivariate analysis was done to independent variables with (totaled p-value < 0.250). Result of multivariate analysis showed that level of knowledge is the most significant factor influencing midwives' roles in implementing PMTCT, (p-value = 0.003, OR = 6.2, and CI 95% = 1.8–21.4) as seen in Table 4.

Table 4. Multivariate Analysis Factors Affecting Midwife's Role in the Mother-to-Child Transmission Prevention Program

Category	B	Sig.	Exp(B)	95% CI for Exp(B)	
				Lower	Upper
Knowledge	1.836	0.003	6.272	1.836	21.431
Constant	−19.209	0.999	0.000		

Note: CI = Confidence Interval

Discussion

Vertical transmission of HIV from mother to child could be prevented by the PMTCT program. Midwives are professional health providers with important, direct roles to play in this regard. Yet, midwives' who implemented the HIV/AIDS prevention program that scored in the good category in this study totaled at just 52.5%. This number showed that implementation of PMTCT has not been very successful. Thus, it coincided with study done in Africa where implementation of PMTCT was just 56.9% or very low.[5]

In the current study, as a part of PMTCT, most midwives counseled pregnant women to take the HIV test. They also offered informed consent and performed the counseling after the test. Most midwives did not

involve the husbands. The midwives also did not use proper protection, e.g., gloves, as directed in the universal precaution standards. This coincided with study conducted in Medan City, where midwives' actions in dealing with PMTCT patients were not in accordance with existing PMTCT psychological and social support guidelines that midwives are expected to provide to HIV positive patients.[9]

There were several things that affected the midwives' ill-informed behavior. One was the low level of knowledge of HIV and PMTCT. More than 50% of respondents did not know that depleted counts of CD4 white blood cells (also known as T-lymphocytes) indicate immunodeficiency, a strong predictor of HIV infection. Likewise, studies conducted in Nigeria and Malawi revealed that pregnant women were frequently not given antiretroviral (ARV) drugs, nor were their CD4 counts ascertained, resulting in high maternal mortality.[10] The midwives also did not know about the type of ARV that could be consumed by pregnant women, the transmission trajectory of HIV, or how to properly conduct a labor assessment for HIV-infected pregnant women. Thus, it was likewise consistent with a study conducted in Medan City, where midwife's knowledge of PMTCT was rated poor.[9] Study by Mohammed,[6] also showed a low midwife's knowledge of HIV PMTCT (65.7%).

The primary source of information on HIV/AIDS for midwives in this study was college lectures. Midwives did not have up-to-date information regarding HIV prevention. Only 5% of midwives admitted having attended an outreach on PMTCT. This, then, was also consistent with the Medan City study that found just one midwife who had been trained in PMTC programs.[9] Research conducted by Setiyawati and Meilani on the initiation of service providers to conduct HIV testing demonstrated it to be the most influential factor on the behavior of HIV testing in pregnant women, thus midwives need to understand these efforts.[11]

Data analysis in this study shows similiarity with demographic data, where majority of midwives' knowledge of HIV and PMTCT were in the low category (score < 56). The bivariate analysis also shows that the proportion of midwives who implemented PMTCT in the good category were those with enough or good knowledge, while those who implemented PMTCT in the unsatisfactory category were those with low levels of knowledge.

Knowledge is one of the predisposing factors for an efficient health program, according to L. W. Green's Precede-Proceed Model. As stated by Ogbanna K, Govender I, Tumbo J, "The high levels of knowledge of the PMTCT program and generally satisfactory implementation" or better practice is predicated on adequate knowledge" meaning that the health provider's knowledge affects the implementation of PMTCT. However, as this study highlighted, midwives' knowledge was not affected by how much information they had but by their experience in implementing PMTCT itself. Knowledge was evidently the strong indicator of behavior in implementing PMTCT. Based on multivariate analysis in this study, midwives with good knowledge implemented PMTCT four times more in a satisfactory way than those with poor knowledge.[5,12,13]

The study also found that midwives' behavior in implementing PMTCT was affected by the availability of information sources through socialization in the workplace. Information source availability was one of the enabling factors in the Precede Model. Many of the midwives had multiple sources of information regarding PMTCT.[8,12]

Socialization in the workplace usually would contain work steps, and facility availability for implementation of PMTCT. Some studies declared that PMTCT implementation was closely related to facility availability. That study explained that in implementing PMTCT, a sufficient supply of latex gloves and clean water would decrease the fear to implement PMTCT.[5,12,13]

Commensurate with the explanation above, in this study, there were sufficient supplies of latex gloves and clean water. What caused inadequate implementation of PMTCT, was the insufficient work periods and responsibilities of the midwives, as well as a lack of information sources about HIV and PMTCT provided by the institutions where the midwives worked. Nor did multiple sources of information translate into improved knowledge. In the future, standards of evaluation will be required to standardize the measures of service provision. Indicators should include funding, service providers, drugs, utilities, PMTCT activities, physical location, supervision, management, and training.[6,14]

Pursuant to numerous studies, there were factors affecting midwife behavior towards the implementation of PMTCT. Two of them were attitudes towards PMTCT and perception of institutional support. In this study, these variables were not statistically meaningful. Midwives' perceptions towards implementation of PMTCT were mostly supportive, even if some of them still felt insecure about it. A major problem they encountered was the limited time available. While for institutional support, most midwives claimed that there was enough support, integrating interventions for prevention of mother-to-fetus HIV transmission, delivery, and breastfeeding, along with other healthcare services, required excess time commitment. Also needed was time spent for improving midwife's knowledge of the male partner in PMTCT.[15-17]

In the previous studies, negative attitudes towards HIV/AIDS disturbed patients.[18] Health workers'

negative attitude to the disease made the patients, especially women, reluctant to do antenatal care.[19] An overview of the effects of stigma on access to and utilization of care and prevention services is also felt by people living with HIV (PLWH).[20] However, in this study, these variables were not statistically significant.

Conclusion

Midwives' knowledge levels about HIV/AIDS and PMTCT are mostly below average. They need more information on PLWHA health indicators, and monitoring their status, antiretrovirals, the risk of mother-child transmission, and the childbirth process of HIV/AIDS mothers. Most respondents had negative attitude to implementation of PMTCT. They had preconceptions toward institutional support, claiming that the institutions were less supportive of PMTCT. They also declared their perceptions of facility availability are included in the good category. They implemented PMTCT in the good category but the poor category was still high. Midwives with higher levels of knowledge of HIV/AIDS will be better equipped to apply PMTCT rather than midwives with less knowledge.

Recommendation

To optimize the PMTCT program, midwives need to improve their knowledge of HIV/AIDS and PMTCT. They also need workshops and outreach about the program and better regulation of the burden of work for midwives, so that they get more time to implement the PMTCT in more effective ways.

References

1. HIV.gov. The global HIV/AIDS epidemic [homepage on the Internet]. 2019. Available from: https://www.hiv.gov/hiv-basics/overview/data-and-trends/global-statistics
2. Kementerian Pemberdayaan Perempuan dan Perlindungan Anak Republik Indonesia. Kasus HIV/AIDS di Indonesia meroket [homepage on the Internet]; 2014. Available from: http://www.kemenpppa.go.id/index.php/page/read/30/385/kasus-hiv-aids-di-indonesia-meroket
3. Nasronudin. HIV&AIDS pendekatan biologi molekuler, klinis dan sosial. Surabaya: Airlangga University Press; 2013.
4. Komisi Penanggulangan AIDS. Data HIV/AIDS DIY 2016 [homepage on the Internet]; 2016. Available from: http://aidsyogya.or.id/2016/data-hiv-aids/data-kasus-hiv-aids-diy-sd-maret-2016/
5. Ogbanna K, Govender I, Tumbo J. Knowledge and practice of the prevention of mother-to-child transmission of HIV guidelines amongst doctors and nurses at Odi Hospital, Tshwane District. South African family practice [serial on the Internet]. 2016; 58(5): 167-71. Available from: https://www.tandfonline.com/doi/full/10.1080/2078-6190.2016.1228561
6. Mohammed E Y F, Kever RT, Martins S D, Afolabi O, Bulama K U. Knowledge, attitudes and practices of nurses on Prevention of Mother-to-Child Transmission (PMTCT) of Human Immuno-deficiency Virus (HIV) in state specialist hospital, Maiduguri, Borno State. Internasional Journal of Nursing and Midwifery [serial on the Internet]. 2016; 8(2): 12-7. Available from: https://academicjournals.org/journal/IJNM/-article-full-text-pdf/42B169F57392
7. Ujiji O A, Rubenson B, Ilako F, Marrone G, Wamalwa D, Wangalwa G, Ekstrom A M. Is 'opt-out HIV testing' a real option among pregnant women in rural districts in Kenya?. BMC Public Health [serial on the Internet]. 2011; 11(3): 151. Available from: http://www.biomedcentral.com/1471-2458/11/151
8. Green L W. Health promotion planning an educational and environmental approach. Mountain View Toronto - London: Mayfield Publishing Company; 2010.
9. Harahap S, Tukiman, Syarah V. Perilaku bidan KIA/KB dalam pelaksanaan program Prevention of Mother-to-Child Transmission (PMTCT) di Rumah Sakit Haji Kota Medan tahun 2013. Jurnal USU [serial on the Internet]. 2015; 1(3): 2. Available from: https://jurnal.usu.ac.id/index.php/kpkb/article/view/5172
10. Okoli J C, Lansdown G E. Barriers to successful implementation of Prevention of Mother-to-Child Transmission (PMTCT) of HIV programmes in Malawi and Nigeria: a critical literature review study. The Pan African Medical Journal [serial on the Internet]. 2014; 19(10): 154. Available from: https://www.ncbi.nlm.nih.gov/pmc/-issues/247193/
11. Setiyawati N, Meilani N. Determinan perilaku tes HIV pada ibu hamil. Jurnal Kesmas Universitas Indonesia [serial on the Internet]. 2015; 9(2): 3. Available from: http://jurnalkesmas.ui.ac.id/kesmas/article/view/565
12. World Health Organization. PMTCT strategic vision 2010-2015: Preventing Mother-to-Child Transmission of HIV to reach the UNGASS and Millennium Development Goals: moving towards the elimination of paediatric HIV; 2009.
13. Okike O, Jeremiah I, Akani C. Knowledge, attitude and practical general medical practitioners in port harcourt towards the prevention of mother-to-child transmission. The Nigerian Health Journal [serial on the Internet]. 2011; 11(9): 3. Available from: https://www.ajol.info/index.php/nhj/article/view/90523
14. Both JMC, Roosmalen JV. The impact of Prevention of Mother-to-Child Transmission (PMTCT) programmes on maternal health care in resource-poor settings: looking beyond the PMTCT Programme - a systematic review. International Journal of Obstetrics and Gynaecology [serial on the Internet]. 2010; 117(12): 1444-50. Available from: https://www.ncbi.nlm.nih.gov/pubmed/20937071
15. Car L T, Velthoven M H V, Brusamento S, Elmoniry H, Car J, Majeed A, Atun R. Integrating Prevention of Mother-to-Child HIV Transmission (PMTCT) programmes with other health services for preventing HIV infection and improving HIV outcomes in developing countries. NBCI Journal [serial on the Internet]. 2011; 15(6): 6. Available from: https://www.ncbi.nlm.nih.gov/pubmed/21678382
16. Horwood C, Haskins L, Vermaak K, Pakathi S, Subbaye R, Doherty T. Prevention of Mother-to-Child Transmission of HIV (PMTCT) programme in KwaZulu-Natal, South Africa: an evaluation of PMTCT implementation and integration into routine maternal, child and women's health services. Tropical Medicine and International Health

[serial on the Internet]. 2010; 15(9): 992–9. Available from: https://www.ncbi.nlm.nih.gov/pubmed/20561313

17. Auvinen J, Kylma J, Valimaki M, Bweupe M, Suominen T. Midwives' perspectives on male participation in PMTCT of HIV and how they can support it in Lusaka, Zambia. Midwifery Journal [serial on the Internet]. 2014; 30(1): 17-27. Available from: https://www.midwiferyjournal.com/article/S0266-6138(13)00046-6/fulltext
18. Turan B, Budhwani H, Fazeli P, Browning W R, Raper J L, Mugavero M J, Turan J M. How does stigma affect people living with HIV? the mediating roles of internalized and anticipated HIV stigma in thr effects of perceived community stigma on health and psychosocial. HHS Author Manuscripts [serial on the Internet]. 2018; 21(1):283-91. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/-PMC5143223/
19. Saki M, Kermanshahi S M K, Mohammadi E, Mohraz M. Perception of patients with HIV/AIDS from stigma and discrimination. Iranian Red Crescent Medical Journal [serial on the Internet].2015; 7(6): e23638. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/-PMC4537784/
20. Badriah F, Tahangnacca M, Alkaf R, Abe T, Hanifah L. Implementation of program for the prevention of mother-to-child transmission of HIV in South Jakarta. Kesmas: National Public Health Journal [serial on the Internet].2018; 12(4): 159-64. Available from: http://journal.fkm.ui.ac.id/kesmas/article/view/1707

Saraswati *et al. Kesmas: National Public Health Journal*. 2019; 14 (2): 95-102
DOI: 10.21109/kesmas.v14i2.2722

Kesmas: National Public Health Journal

Sexual Dysfunction among Women with Diabetes in a Primary Health Care at Semarang, Central Java Province, Indonesia

Lintang Dian Saraswati[1], Ari Udiyono[1], Dian Sutrisni[2], Muh Fauzi[3]

[1]Department of Epidemiology Faculty of Public Health Diponegoro University, Semarang, Indonesia, [2]Women Prison Type II[b] Kudus, Ministry of Law and Human Rights, Indonesia, [3]Department of Medical Environmental Biology and Tropical Medicine, School of Medicine, Kangwon National University, South Korea

Abstract

Sexual dysfunction is associated with pain during sexual intercourse. Diabetes mellitus (DM) has been reported to be one of causal factors for sexual dysfunction in women. This cross-sectional study was conducted to describe status of sexual dysfunction in women with DM in the Tlogosari Kulon Primary Health Care, Semarang, Indonesia, in March 2017. A total of 103 women with DM visiting the Primary Health Care participated in this study. Data were collected using a questionnaire-guided interview and through measurements (blood pressure and random blood glucose test). Results showed that 74.8% of women with DM had sexual dysfunction. The proportion of sexual dysfunction was higher among women in the clinical phase, with uncontrolled blood glucose levels, hypertension grade II, prolonged duration of DM of ≥ 5 years, undergoing insulin treatment, in menopause, grand multiparity, having used the tubectomy contraception method, low physical activity, depression, and consumption of antihypertensive drugs. Three factors showing an increased tendency to cause sexual dysfunction in women with DM were aging process (Odds Ratio (OR) : 0.294, 95% CI: 0.072 - 1.195, p-value = 0.087), menopausal status (OR : 0.102, 95% CI: 0.010 - 1.042, p-value = 0.054), and consumption of antihypertensive drugs (OR : 0.153, 95% CI: 0.033 - 0.712, p-value = 0.170). Main factors related to sexual dysfunction were aging process, menopausal status, and consumption of antihypertensive drugs.

Keywords: Female sexual function index, pathology, physiology, psychosociology, women with diabetes

Introduction

Sexual dysfunction is a disorder in terms of desire for sexual satisfaction and the ability to achieve sexual satisfaction.[1] Sexual dysfunction can have a major impact on the quality of life.[2] In women, it is a significant reproductive health problem as it is associated with the continuity of a woman's reproductive function and can considerably affect the harmony of the relationship between husband and wife.[3]

The etiology of sexual dysfunction in women is multifactorial and combines interpersonal, contextual (social), psychological (such as depression, anxiety, body image perception disorders, traumatic sexual experience in the past, and history of abuse), and biological factors, including several medical conditions (urogenital, neurological, and endocrine disorders, menopause, pregnancy, and obesity) as well as pharmacological and other therapies (anti-neoplasmic agents, antipsychotic and antidepressant medications, antihypertensive agents, major surgical operations, radiation therapies). The risk factors for female sexual dysfunction comprising the social and cultural aspects include a lack of social relationships, poverty, employment status, religious life, educational background, and limited sport activity.[4,5]

Sexual dysfunction in women with DM is known for a long period of time; however, most studies have not described this condition.[6,7] Moreover, results of several studies on pathogenetic factors of sexual dysfunction still remain controversial.[5,8–10]

One study reported no difference in sexual dysfunction between premenopausal (62.1%) and postmenopausal (62.5%) women, but a greater incidence of sexual dysfunction was found in women

How to Cite: Saraswati LD, Udiyono A, Sutrisni D, Fauzi M. Sexual dysfunction among women with diabetes in a primary health center at Semarang, Central Java Province, Indonesia. Kesmas: Public Health Journal. 2019; 14 (2): 95-102. (doi: 10.21109/kesmas.v14i2.2722)

Correspondence: Lintang Dian Saraswati, Department Epidemiology, Faculty of Public Health, Diponegoro University, C Building 2nd Floor, Prof Soedarto SH street Tembalang, Semarang 50275, Indonesia, Phone: +62-8122916641, E-mail: lintang.saraswati@live.undip.ac.id*

Received : October 24th 2018
Revised : February 28th 2019
Accepted : September 6th 2019

from 50 years of age onward. Age was found to negatively correlate with the female sexual function index (FSFI) score ($\rho = -0.324$, p-value < 0.001).[11] The prevalence of sexual dysfunction was significantly higher among the study group than in the control group. The study also found that with an increase in blood glucose (HbA1c) levels, body mass index (BMI), and duration of diabetes, the prevalence of sexual dysfunction also increased.[12]

The prevalence rates of sexual dysfunction in women with diabetes mellitus (DM) and in the control population have been reported to be 88% and 80%, respectively. The mean (standard deviation) FSFI score in women with DM was significantly lower than that in the control group (16.2 [9.5] vs. 21 [8.5], p-value = 0.02). DM demonstrated a clear association with the risk of sexual dysfunction in women.[13] Based on prior study, the negative correlation of age was found to be the most powerful and meaningful to all domains (desire, arousal, lubrication, orgasm, satisfaction, and sexual pain) and total score, followed by the duration of DM.[14] The mean values for arousal, lubrication, dyspareunia, and orgasm were significantly lower only in the type-1 DM group than in the control group. The mean values for desire were lower in type-1 and type-2 DM groups than in the control group.[15] In another study, the mean values for desire, arousal, lubrication, orgasm, satisfaction, and pain were significantly lower in both type-1 and type-2 DM groups than in the control group.[13] In contrast, one study had reported that the duration of DM showed no association with sexual dysfunction in women with DM among the study population.[16] Nevertheless, several studies have reported an association between the duration of DM and sexual dysfunction.[9,17] Coexisting depression has also been reported to have a general link with sexual dysfunction in women with DM.[8,18]

Although sexual dysfunction in men due to the complications of DM has been well explained, the sexual problems of women with DM and their relationship with the risk factors still remain less understood and have not received much attention.[5] On the other hand, sexual dysfunction can have a significant effect on the quality of life. In fact, it is still necessary to investigate the factors associated with sexual dysfunction in women with DM. Based on the above-described information, this descriptive study was conducted to explore the issue of sexual dysfunction in women with DM at a Primary Health Care in Semarang, Central Java Province, Indonesia.

Method

This descriptive cross-sectional study was conducted to measure the prevalence of sexual dysfunction in women with DM in the Tlogosari Kulon Primary Health Care, Semarang City, in March 2017. The study population included women with DM who visited the Tlogosari Kulon Primary Health Care in 2016. A total of 158 subjects were recruited using the total sampling method.

The inclusion criteria were female patients with DM diagnosed at the Tlogosari Kulon Primary Health Care and willing to participate in the study. The final study samples included a total of 103 women. A total of 55 subjects had to be excluded from the study, including 29 who did not have spouse, 4 who died, 12 who refused to participate, and 10 subjects who moved. Data were collected through a questionnaire-guided interview. The study protocol was reviewed and approved by the Committee of Public Health Research Ethics, Diponegoro University (No.52/EC/FKM/2017). Informed written consent was obtained from each respondent after providing information about the study.

Women with DM who fulfilled the inclusion criteria were informed about the purpose, benefit, and procedure of this study. Those who agreed to participate were asked for a written informed consent by the interviewer. This was followed by an interview guided by a questionnaire. Demographic data of the participants were collected through FSFI questionnaires, the Beck Depression Inventory (BDI) questionnaires, and Global Physical Activity Questionnaire (GPAQ).

In this study, sexual dysfunction was described on the basis of psychosocial (education level, employment status, and depression status), physiological (age, menopausal status, parity, BMI, and physical activity), pathological (blood sugar level, blood pressure, and duration of diabetes), and pharmacological (type of treatment, antihypertensive drug consumption, and contraceptive method) factors. The total four sections of the questionnaire were divided into 19 questions of FSFI, 21 questions of Beck Depression Inventory-II, and 15 questions of GPAQ that cover the respondents' demographic details, menopausal status, contraception method, duration of diabetes, type of diabetic treatment, and consumption of antihypertensive drugs. Weight, height, blood pressure, and blood sugar levels (random blood sugar test) of the respondents were also measured in this study.

Disorders occur in one or more of the overall normal sexual response cycle. The toal of questions was amounted to 19 pieces. Classification of sexual dysfunction: 1. Desire, No. Question: 1,2, Score range: 1—5, Multiplication factor: 0.6. 2. Arousal No. question: 3,4,5,6, Score range: 0–5, Multiplication factor: 0.3. 3. Lubrication, No. Question: 7,8,9,10, Score range: 0–5, Multiplication factor: 0.3, 4. Orgasm, No. Question: 11,12,13, Score range: 0–5, Multiplication factor: 0.4, 5. Satisfaction, No. Question: 14,15,16, Score range: 0–5,

Multiplication factor: 0.4, 6. Sexual pain, No. Question: 17,18,19, Score range: 0–5, Multiplication factor: 0.4. The total score was obtained at a minimum of 1.2 and a maximum score of 36 with a cut-off of 63.6 for each domain and a cut-off of 26.5 for all domains. Thus, the category was termed as sexual dysfunction when the FSFI score was ≤ 26.5. The variable of stressful work was measured using the International Stress Management Association (ISMA) questionnaire.[19] According to the ISMA, a person was categorized to have stress if he/she obtained a score was > 14 points and to have no stress if the score is < 14 points. Physical activity was measured using the GPAQ.20 Based on the recommendation by WHO, a total physical activity metabolic equivalent turnover (MET) minutes per week of < 600,[20] was classified as low physical activity, 600–1500 MET minutes per week was classified as moderate, and more than 1500–3000 MET minutes per week was classified as vigorous physical activity. Information regarding variables such as the aging process, employment status, education, sexual desire level, consumption of hypertensive and antidepressant drugs, and smoking status was directly collected from the participant using a questionnaire. Obesity was measured using digital weight scales and microtoise, whereas central obesity was measured using Metline. Blood sugar level and duration of diabetes were collected from the patient's medical record data. Variable aging process is a process of disappearing slowly the ability of tissue to repair itself and maintain its normal structure and function, so that it cannot correct the deficiencies suffered. The categories of aging process included the clinical phase (age ≥ 46 years), the transition phase (age 36 - 45 years), and the subclinical phase (age 25 - 35 years).[21]

Multivariate analysis was used to investigate the collected data. Before inputting the data into the logistic model, a bivariate analysis was conducted to assess the aforementioned independent variables. When the chi-square test revealed significant or nearly significant effects (p-value < 0.05), the variable was considered as the predictor in the multiple logistic regression model and stepwise forward and backward procedures were performed. Finally, the goodness-of-fit test (Hosmer and Lemeshow test) was conducted to assess whether the final model was suited to the data. By excluding the least significant variable from the model, a reduction in value was observed, hence that this variable was retained in the model. Odds ratios (OR) were also calculated.

Results

In Table 1, of the 103 women with DM, 74.8% had

Table 1. Sexual Function Disorder Domain Based on Female Sexual Function Index Scores

Domain	Mean ± SD	Female Patients with DM	
		f	%
HSDD	2.3 ± 1.2	54	52.4
FAD	2.1 ± 2.0	34	33.0
Lubrication	2.3 ± 2.2	26	25.2
FOD	2.5 ± 2.2	22	21.4
Satisfaction	2.5 ± 2.4	23	22.3
SPD	3.0 ± 2.7	15	14.6

Notes: DM (Diabetes Mellitus), HSDD (hypoactive sexual desire disorder), FAD (female arousal disorder), FOD (female orgasmic disorder), SPD (sexual pain disorder)

Table 2. Distribution of Respondents Based on Psychosocial Factors and Physiological Factors

Factors	Variable	Category	Woman with DM (n = 103)	Sexual Function	
				Dysfunction	Normal
Psychosocial	Level of education	Elementary school	41 (39.8%)	33 (80.5%)	8 (19.5%)
		Junior high school	24 (23.3%)	18 (75.0%)	6 (25.0%)
		Senior high school	32 (31.1%)	22 (68.8%)	10 (31.3%)
		Higher education	6 (5.8%)	4 (66.7%)	2 (33.3%)
	Employment status	Housewife	75 (72.8%)	58 (77.3%)	17 (22.7%)
		Employed	28 (27.2%)	19 (67.9%)	9 (32.1%)
	Depression status	Depression	27 (26.2%)	24 (88.9%)	3 (11.1%)
		Normal	76 (73.8%)	53 (69.7%)	23 (30.3%)
Physiological	Aging process	Clinical phase	90 (87.4%)	71 (78.9%)	19 (21.1 %)
		Transition phase	8 (7.8%)	5 (62.5%)	3 (37.5 %)
		Subclinical phase	5 (4.9%)	1 (20.0 %)	4 (80.0%)
	Menopausal status	Yes	75 (72.8%)	61 (81.3%)	14 (18.7%)
		No	28 (27.2%)	16 (57.1%)	12 (42.9%)
	Parity	Grand multiparity	21 (20.4%)	17 (81.0%)	4 (19.0%)
		Multiparity	70 (68.0%)	56 (80.0%)	14 (20.0%)
		Primiparity	9 (8.7%)	3 (33.3%)	6 (66.7%)
		Nulliparity	3 (2.9%)	1 (33.3%)	2 (66.7%)
	BMI	Obesity	52 (50.5%)	38 (73.1%)	14 (26.9%)
		Normal	48 (46.6%)	37 (77.1%)	11 (22.9%)
		Underweight	3 (2.9%)	2 (66.7%)	1 (33.3%)
	Physical activity	Light	8 (7.8%)	8 (100.0%)	0 (0.0%)
		Moderate	81 (78.6%)	59 (72.8%)	22 (27.2%)
		Heavy	14 (13.6%)	10 (71.4%)	4 (28.6%)

Notes: BMI = Body Mass Index, DM = Diabetes Mellitus

sexual dysfunction. The most affected domain was hypoactive sexual desire disorder (HSDD; 52.4%), whereas the least affected domain was sexual pain disorder (SPD; 14.6%).

More than one-third (39.8%) of women with DM attending the Tlogosari Kulon Primary Health Care had elementary school level of education (Table 2). The majority of respondents (72.8%) were housewives. Regarding the level of depression, most of the respondents (73.8%) had normal depression levels. Based on the psychosocial factors, the proportion of sexual dysfunction was higher among those with a primary education (80.5%).

Viewed from the perspective of antiaging process, the majority of women aged > 45 years with DM (87.4%) visiting the Tlogosari Kulon Primary Health Care were in the clinical phase (Table 2). More than half of them (50.5%) had obesity according to BMI status. The majority of them (78.6%) had moderate physical activity. Most women with DM (68.0%) were included in the multiparity group (2–4 births), and 72.8% of them had experienced menopause. Based on the physiological factors, the proportion of sexual dysfunction was higher among women with DM in the clinical phase of aging process (78.9%), in menopause (81.3%), and those with grand multiparity (81.0%), normal BMI status (77.1%), and low physical activity (100.0%).

The majority of women with systolic and diastolic blood pressure were categorized as prehypertensive (46.6% and 43.7%, respectively, Table 3). The proportion of sexual dysfunction was higher among those who had grade II systolic hypertension (94.1%), and grade II diastolic hypertension (81.0%). Most of the women with DM (78.6%) used oral hypoglycemic agents (OHAs) (Table 4). Regarding contraceptive use, approximately half of the respondents (48.5%) had a record of using hormonal contraceptives (pills, injection, and implants).

The majority of study participants (77.1%) visiting the Tlogosari Kulon Primary Health Care had diabetes for less than 5 years (Table 5). The longest duration of DM was 21 years, and the shortest was 4 months, with an average duration of 4.3 years. Most of them (77.8%) had uncontrolled blood sugar levels (> 200 mg/dL), with an average level of 261.6 mg/dL. Moreover, most of them (65.7%) did not take antihypertensive drugs. The proportion of sexual dysfunction was higher among those who used insulin (87.5%), tubectomy contraceptives (82.4%), and antihypertensive drugs (93.9%).

Based on multivariate analysis (Table 6), three factors were found to increase the risk for sexual dysfunction in women with DM: aging process (p-value = 0.087; OR = 0.294), menopausal status (p-value = 0.054; OR = 0.102), and consumption of antihypertensive drugs (p-value = 0.170; OR = 0.153).

Table 3. Distribution of Respondents Based on Pathological Factors

Variable	Category	Women with DM (n = 103)	Sexual Function	
			Dysfunction	Normal
Systolic blood pressure	Hypertension grade II	17 (16.5%)	16 (94.1%)	1 (5.9%)
	Hypertension grade I	23 (22.3%)	17 (73.9%)	6 (26.1%)
	Prehypertension	48 (46.6%)	34 (70.8%)	14 (29.2%)
	Normal	15 (14.6%)	10 (66.7%)	5 (33.3%)
Diastolic blood pressure	Hypertension grade II	21 (20.4%)	17 (81.0%)	4 (19.0%)
	Hypertension grade I	20 (19.4%)	16 (80.0%)	4 (20.0%)
	Prehypertension	45 (43.7%)	32 (71.7%)	13 (28.9%)
	Normal	17 (16.5%)	12 (70.6%)	5 (29.4%)

Notes: DM = Diabetes Mellitus

Table 4. Distribution of Respondents Based on Pharmacological Factors

Variable	Category	Woman with DM (n = 103)	Sexual Function	
			Dysfunction	Normal
Type of treatment	OHA	81 (78.6%)	61 (75.3%)	20 (24.7%)
	Insulin	8 (7.8%)	7 (87.5%)	1 (12.5%)
	OHA + insulin	3 (2.9%)	2 (66.7%)	1 (33.3%)
	Diet + exercise	11 (10.7%)	7 (63.6%)	4 (36.4%)
Contraceptive method	Hormonal	50 (48.5%)	38 (76.0%)	12 (24.0%)
	Tubectomy	17 (16.5%)	14 (82.4%)	3 (17.6%)
	IUD	10 (9.7%)	6 (60.0%)	4 (40.0%)
	None	26 (25.2%)	19 (73.1%)	7 (26.9%)

Notes: OHA = Oral Hypoglycemic Agents, IUD = Intra-Uterine Device

Table 5. Association of Independent Variables with Sexual Dysfunction Status among Women

Variable	Category	Sexual Function		p-Value	OR (95% CI)
		Dysfunction	Normal		
Employment status	Housewives	58 (77.3%)	17 (22.7%)	0.325	1.616 (0.61-4.22)
	Employed	19 (67.9%)	9 (32.1%)		
Level of depression	Depression	24 (88.9%)	3 (11.1%)	0.049	3.472 (0.95-12.69)
	Normal	53 (69.7%)	23 (30.3%)		
Aging process	Clinical and transition phase	76 (77.6%)	22 (22.4%)	0.014	13.818 (1.46-130.07)
	Subclinical phase	1 (20.0%)	4 (80.0%)		
Menopausal status	Yes	61 (81.3%)	14 (18.7%)	0.012	3.268 (1.2–6–8.42)
	No	16 (57.1%)	12 (42.9%)		
Parity	Yes	76 (76.0%)	24 (24.0%)	0.156	6.33 (0.55–72.9)
	No	1 (33.3%)	2 (66.7%)		
BMI	Overweight and underweight	40 (72.7%)	15 (27.3%)	0.612	0.793 (0.32–1.94)
	Normal	37 (77.1%)	11 (22.9%)		
Physical activity	Low and high	18 (81.8%)	4 (18.2%)	0.390	1.678 (0.51–5.51)
	Moderate	59 (72.8%)	22 (27.2%)		
Duration of DM	≥ 5 years	27 (77.1%)	8 (22.9%)	0.689	1.215 (0.46–3.15)
	< 5 years	50 (73.5%)	18 (26.5%)		
Consumption of antihypertensive drugs	Yes	31 (93.9%)	2 (6.1%)	0.002	8.087 (1.78–36.7)
	No	46 (65.7%)	24 (34.3%)		
Blood sugar levels	Uncontrolled	56 (77.8%)	16 (22.2%)	0.282	1.667 (0.65–4.29)
	Controlled	21 (67.7%)	10 (32.3%)		
Systolic blood pressure	Hypertension	67 (76.1%)	21 (23.9%)	0.521	1.599 (0.49–5.19)
	Normal	10 (66.7%)	5 (33.3%)		
Diastolic blood pressure	Hypertension	65 (75.6%)	21 (24.4%)	0.761	1.290 (0.40–4.08)
	Normal	12 (70.6%)	5 (29.4%)		
Level of education	Elementary and high school	73 (75.3%)	24 (24.7%)	0.641	1.52 (0.26–8.83)
	Higher education	4 (66.7%)	2 (33.3%)		
Contraceptive use	Yes	58 (75.3%)	19 (24.7%)	0.820	1.125 (0.41–3.08)
	No	19 (73.1%)	7 (26.9%)		
Contraceptive method	Tubectomy	14 (82.4%)	3 (17.6%)	0.551	1.704 (0.44–6.46)
	Others and none	63 (73.3%)	23 (26.7%)		

Notes: BMI = Body Mass Index, DM = Diabetes Mellitus, OR = Odd Ratio, CI = Confidence Interval

Table 6. Results of Multivariate Analysis

Independent Variable	p-Value	OR (95% CI)
Aging process	0.087	0.294 (0.072–1.195)
Menopausal status	0.054	0.102 (0.010–1.042)
Consumption of antihypertensive drugs	0.170	0.153 (0.033–0.712)

Notes: CI = Confidence Interval, OR = Odd Ratio

Discussion

Diabetes causes dysfunctions of blood vessels and nerves, which lead to structural and functional changes in the female genitals, thereby disrupting the sexual responses. Furthermore, hyperglycemia can reduce the hydration of mucous membranes, including the vaginal tissues, causing reduced vaginal lubrication and dyspareunia. Hyperglycemia potentially triggers dyspareunia due to its association with increased incidence of genitourinary infections.[5,22] The hormonal imbalance accompanying DM also plays a vital role in the pathogenesis of sexual dysfunction in women. Diabetes also causes complications such as blood flow disruptions to sexual organs and hypogonadism, which present as abnormal hypophysical and hypothalamic functions.[9,22,23] In this study, sexual dysfunction was found in 74.8% of women with DM, which is consistent with a study in 2015 that reported an incidence of 78.7%.[18] However, a later study conducted in 2016 reported an incidence of 55.9% of sexual dysfunction in women with DM.[17] Studies have also demonstrated that sexual dysfunction is prevalent in both women and men with DM.[6,24,25]

The results of this study demonstrated that women with DM and grade II hypertension were at risk of developing sexual dysfunction. The higher the blood pressure, the lower the sexual function. This result was consistent with studies conducted in Turkey, which reported that the average FSFI score of women with hypertension (19.6) was lower than that of women without hypertension (22.4), with a significant difference (p-value = 0.012). In addition, there was a mean difference in the FSFI scores on the domains of desire, arousal, orgasm, and satisfaction (p-value < 0.05),

whereas there was no difference in the average FSFI score on the lubrication and pain domains.[17] Vascular dysfunction due to hypertension could lead to disruption of blood flow and clitoral function as erectile organs in women.[26] High blood pressure could be a causal factor for a person's low sexual passion.

However, the use of antihypertensive drugs also has a negative impact on the sexual appetite, especially diuretic medicines and beta-blockers.[27] These medicines work by reducing and maintaining a low blood pressure when blood flows to the genital organs, which would ultimately inhibit blood flow to the genital organs. Thus, these individuals could experience difficulty in obtaining and maintaining an erection or orgasm, thereby causing sexual dysfunction.[28] The problem that generally arises in women is the lack of production of vaginal fluids that serve as a lubricant during intercourse.[27]

This study demonstrated that the higher the age, the lower the FSFI score or the sexual function. Persons in the age of the clinical phase (> 45 years) were more likely to suffer from sexual dysfunction than those in the subclinical phase and transition phase, which is because in the clinical phase, the presentations of aging begin to be clearly visible, including hair loss, skin wrinkles, high blood pressure, diabetes, heart problems, memory loss, and decreased libido.[29,30] Several studies have reported that sexual function decreases with age. Increasing age leads to a decrease in testosterone levels, which in turn are associated with decreased sexual desire in both men and women. Thus, the incidence of sexual dysfunction increases with age.[31] Women in the third phase or the clinical phase are not included in the women of childbearing age category. Women in the women of childbearing age category are defined as those whose reproductive organs functioned well between the age of 20 and 45 years.[32] In this study, most of the women with DM were not classified in the women of childbearing age category. This result was in accordance with a study conducted in West Jakarta that demonstrated that age affected sexual dysfunction in women. The most dominant variable associated with sexual dysfunction was age (p-value = 0.007, OR = 3.45). Elderly people had three times greater risk of developing sexual dysfunction than younger individuals.[32]

In addition, this study has shown that menopausal women with DM tend to suffer from sexual dysfunction compared with women without DM. Women experience major hormonal changes associated with menopause, one among which is a decrease in estrogen levels. In terms of sexual functioning, the major impact of the reduction of estrogen levels is vaginal dryness and atrophy caused due to reduced blood flow, resulting in dyspareunia that in turn causes uncomfortable sexual activity. Besides causing physiological changes such as cessation of fertility, the other effects of menopause include psychological changes that trigger a negative attitude in postmenopausal women and increase their susceptibility to depression.[33,34] The incidence of sexual dysfunction among postmenopausal women has been reported to be almost 80%.[35] This result was consistent with a study conducted in New York City, which reported that the incidence of sexual dysfunction in postmenopausal women was at 70.9%. Another study involving 370 women aged 40–65 years reported that 67% of them experienced sexual dysfunction and postmenopausal women had two times greater risk for sexual dysfunction than premenopausal women.[36]

A limitation of this study is that there could have been a bias in the information, probably for variables such as sexual function disorder and level of depression, as these variables were directly enquired with the participants using questionnaires at their house in the evening when their spouse was also present. Hence, respondents might have been reluctant to give an honest response regarding their depression status, whether it existed or not, and the sexual function disorders they have. It is also possible that because the interviews were conducted in the afternoon or evening after working hours, the respondents could have answered as needed due to fatigue. The strength of this study is that it reports the proportion of sexual dysfunction among women through which its risk factors can be identified, so that the related authorities can implement promotional and preventive measures.

Conclusion

In this study, three factors found to increase the risk for sexual dysfunction in women with DM were aging process, menopausal status, and consumption of antihypertensive drugs. The higher the blood pressure, the lower the sexual function in women with DM due to the consumption of antihypertensive drugs, which inhibits blood flow to the genital organs. This study also demonstrated that the higher the age, the lower the FSFI score or the sexual function, because in the clinical phase, the presentations of aging begin to be clearly visible, especially decreased libido. In terms of sexual functioning, the major effects of the reduction of estrogen levels during menopause are the physical and psychological changes, such as the vaginal dryness and atrophy due to reduced blood flow, resulting in dyspareunia that in turn causes uncomfortable sexual activity and might also lead to depression.

Regarding the limitation, the authors clearly state that biased information was inevitable and might affect the results of this study. The cause of the biased information in this study was the involvement of other people who were not respondents in answering the questions;

however, this could be minimized by inviting the respondents to a place far from the crowd before the interview began.

Acknowledgment

The authors would like to thank the chief of the Tlogosari Kulon Primary Health Care and all staff for their support to this study. The authors also thank all the respondents for their cooperation in this study. The authors are also grateful to Putri Septyarini for data collection and analysis and also to the Faculty of Public Health, Diponegoro University, for the funding.

References

1. American Psychiatric Organization. Diagnostic and statistical manual of mental disorder (DSM-IV). American Psychiatric Organization. Washington, DC: American Psychiatric Association; 2012. 1–915.
2. Angelina A, Parlautan A, Putri A, Yuvensia AM, Pratama AN, Falaivi AF, et al. Prevalence of sexual dysfunction based on female sexual function index and perception of newly bride in Jati Village and its related factors. Indonesian Journal Obstetrics and Gynecology [Internet]. 2010 [cited 2018 Feb 26]; 34(4): 231–5. Available from: http://id.portalgaruda.org/?ref=browse&mod=viewarticle&article=30481
3. Andarmoyo S. Psikoseksual dalam pendekatan konsep dan proses keperawatan. Jogjakarta: Ar-Ruzz Media. 2012: 83–92.
4. Woodard TL, Diamond MP. Physiologic measures of sexual function in women: a review. Fertil Steril [Internet]. 2009 Jul [cited 2019 Jun 22];92(1):19–34. Available from: http://www.ncbi.nlm.nih.gov/-pubmed/19046582
5. Bargiota A, Dimitropoulos K, Tzortzis V, Koukoulis GN. Sexual dysfunction in diabetic women. Hormones [Internet]. 2011 [cited 2018 Mar 26];10(3):196–206. Available from: http://www.hormones.gr/-pdf/196-206.pdf
6. Esposito K, Maiorino MI, Bellastella G, Giugliano F, Romano M, Giugliano D. Determinants of female sexual dysfunction in type 2 diabetes. International Journal of Impotence Research [Internet]. 2010 [cited 2019 Jun 29]; 22(3): 179–84. Available from: http://www.ncbi.nlm.nih.gov/pubmed/20376056
7. Mohsenpour B, Alizadeh N, Alizadeh N, Arasteh M, Karimian F. Comparison of sexual dysfunction between diabetic and non-diabetic women. Journal of Mid-life Health [Internet]. 2013 [cited 2019 Jun 29]; 4(3): 167. Available from: http://www.ncbi.nlm.nih.gov/pubmed/24672189
8. Giraldi A, Kristensen E. Sexual dysfunction in women with Diabetes Mellitus. Journal of Sex Research [Internet]. 2010 [cited 2018 Feb 26]; 47(2–3): 199–211. Available from: http://www.tandfonline.com/doi/-abs/10.1080/00224491003632834
9. Maiorino MI, Bellastella G, Esposito K. Diabetes and sexual dysfunction: current perspectives. Diabetes, Metabolic Syndrome and Obesity [Internet]. 2014 [cited 2019 Jun 22]; 7: 95–105. Available from: http://www.ncbi.nlm.nih.gov/pubmed/24623985
10. Lema VM. Female sexual dysfunction and gynaecological practice: report of six cases. East African Medical Journal [Internet]. 2012 [cited 2019 Jun 29]; 89(9): 312–7. Available from: http://www.ncbi.nlm.nih.gov/pubmed/26852439
11. Carranza-Lira S, Núñez F de DC. Sexual dysfunction prevalence in a group of pre- and postmenopausal Mexican women. Menopausal Review [Internet]. 2018 [cited 2019 Jun 29]; 17(1): 39–42. Available from: http://www.ncbi.nlm.nih.gov/pubmed/29725284
12. Bal MD, Yılmaz SD, Çelik SG, Dinçağ N, Beji NK, Yalçın Ö. Does the Diabetes of type 2 affect the sexual functions of women?. Journal of Sex & Marital Theraphy [Internet]. 2015 [cited 2019 Jun 29]; 41(1): 107–13. Available from: http://www.ncbi.nlm.nih.gov/pubmed/24341832
13. Ahmed MR, Shaaban MM, Sedik WF, Mohamed TY. Prevalence and differences between type 1 and type 2 Diabetes Mellitus regarding female sexual dysfunction: a cross-sectional Egyptian study. Journal of Psychosomatic Obstetrics & Gynecology [Internet]. 2018 [cited 2019 Jun 29]; 39(3): 176–81. Available from: http://www.ncbi.nlm.nih.gov/pubmed/28436753
14. Saraswati, Made Ratna SSF. Disfungsi seksual pada wanita penderita Diabetes Melitus tipe 2. Jurnal Penyakit Dalam. 2011; 12: 92–7.
15. Mazzilli F, Mazzilli R, Imbrogno N, Jlenia E, Delfino M, Bitterman O, et al. Sexual dysfunction in diabetic women: prevalence and differences in type 1 and type 2 Diabetes Mellitus. Diabetes, Metabolic Syndrome and Obesity: Targets and Theraphy [Internet]. 2015 [cited 2019 Jun 29]; 8: 97. Available from: http://www.ncbi.nlm.nih.gov/pubmed/25709482
16. Fatemi SS, Taghavi SM. Evaluation of sexual function in women with type 2 diabetes mellitus. Diabetes and Vascular Disease Research [Internet]. 2009 [cited 2018 Feb 26]; 6(1): 38–9. Available from: http://journals.sagepub.com/doi/10.3132/dvdr.2009.07
17. Tuncel E, Durgun O, Peynirci H, Ersoy C. Sexual dysfunction in female patients with type 2 diabetes mellitus: a cross-sectional single-centre study among Turkish patients. Hum Fertil [Internet]. 2017 [cited 2018 Mar 26]; 20(3): 192–9. Available from: https://www.tandfonline.com/-doi/full/10.1080/14647273.2016.1266039
18. Elyasi F, Kashi Z, Tasfieh B, Bahar A, Khademloo M. Sexual dysfunction in women with type 2 Diabetes Mellitus. Iranian Journal of Medical Science [Internet]. 2015 [cited 2018 Feb 26]; 40(3): 206-13. Available from: http://ijms.sums.ac.ir/index.php/IJMS/article/viewFile/1673/406
19. Interanational Stress Management Association (ISMA). Stress questionnaire [Internet]. International Stress Management Association UK. 2013 [cited 2015 Sep 18]: 9–11. Available from: www.isma.org.uk
20. World Health Organization. GPAQ (Global Physical Activity Questionnaire) [Internet]. Surveillance and Population-Based Prevention Prevention of Noncommunicable Diseases Department World Health Organization. [cited 2015 Sep 15]. Available from: www.who.int/chp/steps
21. Dziechciaż M, Filip R. Biological psychological and social determinants of old age: Bio-psycho-social aspects of human aging. Annals of Agric ultural and Environmental Medicine [Internet]. 2014 [cited 2019 May 25]; 21(4): 835–8. Available from: http://www.journalssystem.com/aaem/Biological-psychological-and-social-determinants-of-old-age-Bio-psycho-social-aspects-of-human-aging,72207,0,2.html
22. Meeking D, Fosbury J, Cummings M. Sexual dysfunction and sexual health concerns in women with diabetes. Practical Diabetes [Internet]. 2013 [cited 2019 Jun 29]; 30(8): 327–31a. Available from: http://doi.wiley.com/10.1002/pdi.1805

23. Bargiota A, Dimitropoulos K, Tzortzis V, Koukoulis G. Sexual dysfunction in diabetic women. Hormones [Internet]. 2011 [cited 2019 Jun 15];10(3):196–206. Available from: http://www.ncbi.nlm.nih.gov-/pubmed/22001130
24. Enzlin P, Rosen R, Wiegel M, Brown J, Wessells H, Gatcomb P, et al. Sexual dysfunction in women with type 1 diabetes: long-term findings from the DCCT/ EDIC study cohort. Diabetes Care [Internet]. 2009 May 1 [cited 2019 Jun 29];32(5):780–5. Available from: http://www.ncbi.nlm.nih.gov/pubmed/19407075
25. Giugliano F, Maiorino M, Bellastella G, Gicchino M, Giugliano D, Esposito K. Determinants of erectile dysfunction in type 2 diabetes. Int J Impot Res [Internet]. 2010 May 11 [cited 2019 Jun 29];22(3):204–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/20147958
26. Dodie NJ, Tendean L, Wantouw B. Pengaruh lamanya Diabetes Melitus terhadap terjadinya disfungsi ereksi. Jurnal e-Biomedik. 2013; 1(3): 1120–5.
27. Manan E. Bebas dari ancaman disfungsi seksual khusus wanita. 1st ed. Jogjakarta: Buku Biru; 2013.
28. Antou, Edmond K R, Lusiana Satiawati LT. Pengaruh hipertensi terhadap disfungsi ereksi. e-Biomedik. 2014;2(November):1–8.
29. Christoffersen M, Tybjærg-Hansen A. Visible aging signs as risk markers for ischemic heart disease: epidemiology, pathogenesis and clinical implications. Ageing Research Reviews [Internet]. 2016 [cited 2019 Jul 4]; 25: 24–41. Available from: http://www.ncbi.nlm.nih.gov/pubmed/26590331
30. Kizilay F, Gali HE, Serefoglu EC. Diabetes and sexuality. Sexual Medicine Reviews [Internet]. 2017 [cited 2019 Jul 4]; 5(1): 45–51. Available from: http://www.ncbi.nlm.nih.gov/pubmed/27544297
31. Badan Penelitian dan Pengembangan Kesehatan. Riset Kesehatan Dasar (RISKESDAS) Lap Nas 2013. 2013;1–384.
32. Batlajery J, Hamidah H, Mardiana M. Penggunaan metode kontrasepsi suntikan dmpa berhubungan dengan disfungsi seksual wanita pada akseptor kb suntik. Jurnal Ilmu dan Teknologi Kesehatan [Internet]. 2015; 2(2): 49–56. Available from: http://ejurnal.poltekkesjakarta3.ac.id/index.php/jitek/article/view/46
33. DeLamater J, Karraker A. Sexual functioning in older adults. Current Psychiatry Reports [Internet]. 2009 [cited 2018 Mar 26]; 11(1): 6–11. Available from: http://www.ncbi.nlm.nih.gov/pubmed/19187702
34. Andini D. Hubungan lama menopause dengan kejadian disfungsi seksual pada wanita menopause di posyandu lansia wilayah kerja puskesmas Panjang Bandar Lampung [Internet]. Universitas Lampung; 2015. Available from: http://digilib.unila.ac.id/6407/
35. Ambler DR, Bieber EJ, Diamond MP. Sexual function in elderly women: a review of current literature. Reviews in Obstetrics and Gynecology [Internet]. 2012 [cited 2018 Mar 27]; 5(1): 16–27. Available from: http://www.ncbi.nlm.nih.gov/pubmed/22582123
36. Cabral PUL, Canário ACGMD, Spyrides MHC, Uchôa SA da C, Eleutério Júnior J, Giraldo PC, et al. Physical activity and sexual function in middle-aged women. Rev Assoc Med Bras [Internet]. 2014 [cited 2018 Mar 27];60(1):47–52. Available from: http://www.ncbi.nlm.-nih.gov/pubmed/24918852

SUBSCRIPTION FORM

The undersigned:

Name : .....
Address : .....
.....
.....
Phone Number : .....
E-mail : .....
Edition : .....

is willing to be Kesmas: National Public Health Journal customer paying the cost amount Rp. 750,000,-/year/4 edition (include postage expense)*.

....., ...

(.....)

*If buying previous edition and more than 2 (two) copies per transaction, the costumer is charged postage expense.

Please make a bank transfer payment to:
UNIVERSITAS INDONESIA BHPP
BANK BNI UI DEPOK
ACCOUNT NO. 1273000568
SWIFT CODE: BNINIDJA

Then please send the proof of payment to:
Secretariat of Kesmas: National Public Health Journal
G301 Building G 3rd Floor
Faculty of Public Health Universitas Indonesia
Kampus Baru UI Depok 16424
Mobile Phone: +62815-1141-6600
or email: jurnalkm@ui.ac.id or jurnalkesmas.ui@gmail.com

Reviewer Acknowledgment
Kesmas: National Public Health Journal
Volume 14, August 2019 - November 2019

Editorial Team of Kesmas: National Public Health Journal highly appreciate and really thank all Reviewers for kind assistance in Volume 14 Number 1 - 2 :

Anamai Thiravirojana
Aria Kusuma
Asnawi Abdullah
Besral
Diah Utari
Dian Ayubi
Djazuly Chalidyanto
Doni Ramdhan
Ede Darmawan
Ella Hadi
Emi Nurjasmi
Fridawati Rivai
Johan Budiman
Meily Widjaja
Meiwita Budiharsana
Mohammad Rahfiludin
Nur Zakiah
Rachmat Hargono
Rahma Dewi
Santi Martini
Tris Eryando
Umar Achmadi

Author Index
Kesmas: National Public Health Journal
Volume 14, August 2019 - November 2019

Subject Index
Kesmas: National Public Health Journal
Volume 14, August 2019 - November 2019

SUBSCRIPTION FORM

The undersigned:

Name : .....
Address : .....
.....
.....
Phone Number : .....
E-mail : .....
Edition : .....

is willing to be Kesmas: National Public Health Journal customer paying the cost amount Rp. 750,000,-/year/4 edition (include postage expense)*.

....., ...

(.....)

*If buying previous edition and more than 2 (two) copies per transaction, the costumer is charged postage expense.

Please make a bank transfer payment to:
UNIVERSITAS INDONESIA BHPP
BANK BNI UI DEPOK
ACCOUNT NO. 1273000568
SWIFT CODE: BNINIDJA

Then please send the proof of payment to:
Secretariat of Kesmas: National Public Health Journal
G301 Building G 3rd Floor
Faculty of Public Health Universitas Indonesia
Kampus Baru UI Depok 16424
Mobile Phone: +62815-1141-6600
or email: jurnalkm@ui.ac.id or jurnalkesmas.ui@gmail.com