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

I am working as a nurse at a dental clinic in Ambon. The article from Kesmas: National Public Health Journal Volume 14 Issue 2 titled "Overweightness and Obesity with Dental Caries among Children Aged 7-12 Years Old in Badung District, Bali, Indonesia 2018" gave me new insights regarding the risk factors of dental caries. Although the study was conducted in Bali, the same case could also possibly occur in my region. As someone who is working in the dental field, reading this article opened my mind to the fact that overweightness and obesity are strongly linked with dental caries. I hope more dental practicians can read the article and obtain new useful information like I did. (Lois Laksa, Ambon)

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Effects of Diabetes on the Output of Farmer and Its Policy Implications

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Abstract

This study investigated the impact of diabetes on work performance of different farming communities from Punjab, Pakistan. This study was based on cross-sectional data. A representative sample of 374 farmers was collected from five selected districts. Three types of respondents were analyzed in the study e.g., laborer, small and large growers. Poisson and logistic regression techniques were used for the sake of analysis. According to the investigated results for the labor category, respondents with more age, less qualification, low earning per month (Rupees), and having positive record of family diabetes, would have more leave per month. In the same way, findings for small farmers revealed that education, family size, family with diabetic records, marital status and availability at farm (hour/day) were significant. In case of third category, study outcome highlighted that age, education, marital status, having positive record of family diabetes and number of hours spent at farm would be positively correlated with the reduction in working efficiency at farm due to diabetes. It can be concluded that diabetes have negative influence on the work performance of selected farming groups.

Keywords: agriculture, diabetes, farming communities, Punjab, work performance

Introduction

There is an increasing trend in the demand for human capital with the passage of time in the growing world.[1-3] According to the 2015 Human Capital (HC) Report, health is one of 46 indicators of HC index. Human Capital has been affected negatively due to different types of diseases such as diabetes.[4] Diabetes is the most prevalent disease caused by metabolic disorders; in other words, it is the most prevalent endocrine disease. Nowadays, diabetes is the fifth leading cause of mortality in Western societies and the fourth reason of visiting doctors. Diabetes is a growing threat to world health. It is disease that causes high blood sugar, low production of insulin as well as inefficient work of body cells.[5-7] Approximately 350 million people are suffering from the disease.[8] There are mainly three types of diabetes e.g., type one (body cell fails to produce the insulin), type two (low production of insulin by the body cell) and gestation diabetes (high blood sugar in the pregnant women).

Diabetes can cause undesirable consequences in all parts of human body; therefore, devastating complications of this disease are the strong evidence for the importance of its consideration. One important reason to consider diabetes is the high expense of this disease. Several studies worldwide have given enough reasons to increase concerns in this regard. This cost is increasing the economic cost of health for poor farming communities who are already on the margins of poverty. The growth of any economy can be spurred by the active and healthy participation of human capital in term of labor force, especially in developing countries like Pakistan.[9-11] Agriculture sector is the main contributor to Gross Domestic Product (GDP) in Pakistan and employs around 60% of the labor force. Income and subsequently the standard of living also perturb due to diminution in the labor force participation as a result of diabetes. The developed countries, as well as developing countries, are going to face an upward trend in diabetes.[12]

There are two main pillars of every economy in the growing world, namely agriculture and industrial sector.[13-15] These two sectors are considered as the sourceof jobs creation in the scenario of population growth.[16,17] All countries across the world are classified into two categories, namely agricultural (labor intensive) and industrial (capital intensive) on the basis of their

economies. Mostly developing countries like Pakistan are agricultural based.[18,19] Agriculture sector in Pakistan plays a vital role in term of growing economy as well as for job creation. Of the total employment, 48% was directly related with the agriculture sector, making it the main source of employment.[20]

Overall, agriculture sector is closely linked with employment, export earning, industrial raw materials, infrastructure development, economic growth, declining of rural areas poverty, improvement in the banking sector and advancement in technologies.[21-24] Cotton, rice and wheat are the main crops of Pakistan which are exported to other nations.[25-31]The industrial sector in Pakistan also relies on the raw material obtained from agriculture and this sector is labor intensive. Efficiencies of labor are being negatively impacted due to increase in the prevalence diabetes.

Agriculture sector mainly deals with the labor, farmers and tenants. If one of them gets disturbed due to any chronicle disease, it may cause decrease in the efficiency of overall production. There is an inverse relationship between the efficiency of worker and diabetes.[32-34] The efficiency, productivity and ultimately the earnings of men as well as women is negatively affected by such types of diseases.

Studies were conducted in other countries related to impact of diabetes on work, productivity, employment, earnings, cardiovascular diseases, stroke, work loss, premature mortality, depression and cold, self-care problems and diabetes cost borne by middle-income countries. For instance, there exist studies on hypertension, positive family records and obesity-related to labor force participation but the study examining the effects of diabetes on work performance of farming communities has not been conducted in Pakistan as well as at international level. There is a need to explore the consequences of diabetes and its effects on the workforce performance. It discourages and inactivates the labor's capabilities and functioning activities. This was first study to examine the impact of diabetes prevalence on the farming communities in Punjab, Pakistan. This study would fulfil this research gap. This study investigated the impact of diabetes on the work performance of selected agribusiness groups. Three different types of analyses were conducted. First, effect of disease on the productivity of labor was quantified. Second, analysis answered the research question, weatherwork efficacy of small farming community is declining due to diabetes because it has direct effect on health as well as on the households. In the last and third, impact of diabetes on large farmer was assessed.

Method

Study used diagnostic study design by using survey

data. Agricultural economists' oftenly confronts with two types of economic problems related to behavior and labor. This study was about behavioral economics and it had tried to use theory to find out the solutions for respondents toward making healthy decisions. Impact of diabetes on the workforce performance of different type of agricultural communities was quantified. Verbal consent of all the respondents was taken. Participants were clearly briefed that their data would only be used for the study purpose and they agreed to give required information. The authors declared that they did not have any conflict of interests.

For the sake of data collection, Punjab Province was selected as the universe for study as it is the most populated and developed province of country. Study area could be divided into three categories generally that are, Northern, Central and Southern Punjab. Districts were selected in the sample on the basis of their population size. From these three areas of Punjab Province, District Rawalpindi was taken from Nothern region as it is most populous district of Northern Punjab. Districts of Faisalabad and Sheikhupura were taken from Central Punjab as these are the second and eleventh most populous districts of Punjab. Bhakkar is also among populous districts of Southern Punjab. Further details are given in Table 1. At least one district was considered from these three regions and data was collected from the five districts of Rawalpindi, Faisalabad, Multan, Sheikhupura and Bhakkar. Survey was conducted during December 2018 to January 2019.

Sample of 374 farmers who are diabetic patients was collected. Patients suffering from Type-I and Type-II diabetes were included in the study. A well-structured and pretested questionnaire was used to collect the required information. Simple random sampling technique was used for the survey as the population is homogeneous in nature. Three types of respondents were taken in the study e.g., laborer, small growers and large growers. Representative sample contained 124 farm labor workers, 125 small farmers and 125 large farmers. Respondents' with land less and working on the farms as casual, monthly paid or seasonally paid labor were considered in 'farm labor workers' category. The

Table 1. Detail of Selected Districts

Sr. No.	District	Area (km²)	Population (2017)	Density (people/km²)	Division
1	Faisalabad	5,856	7,873,910	1344	Faisalabad
2	Rawalpindi	5,286	5,405,633	1322	Rawalpindi
3	Multan	3,720	4,745,109	1275	Multan
4	Sheikhupura	5,960	3,460,426	580	Lahore
5	Bhakkar	8,153	1,650,518	202	Sargodha

Note: Sr: Serial Number
Source: Pakistan Bureau of Statistics

respondents owning or farming land from 1 to 12.5 acre were considered as small farmers. Then, respondents farming more than 12.5 (owned, shared or rented in) were taken as large growers in the sample. Simple random sampling technique was used for the survey as the data is homogeneous in nature. Information related to socio-economic and demographic characteristics, family and personal medical records, and farm-related activities was gathered. Impact of selected characteristics like age, household head, education, family size, earnings, marital status, family diabetes, delivery of payment, farm availability, leisure hours/day, balanced diet was quantified on the work performance at farm for all three categories of farming community, separately. Logged variables were taken in the analysis and dependent variables were absent days per month for the case of laborer analysis, and efficiency loss was taken as regress and for other two models. These variables have already been used in the previous similar studies.[35-38]

Statistically analysis was performed with SPSS software version 19. There are many methods which deals with probabilities of disturbance. Disturbance of error term is always normally distributed between zero mean and constant variance. However the linear probability model is not able to explain the condition of normal distribution, so with the passage of time, for the estimation of normal distribution of error term between zero mean and constant variance, Logit and Probit model are oftenly being used. Basically, these both models explain the function of concern variables. Logit is the version of simple mathematics, while Probit is based on the integration method. For the empirical estimation of concern relationship among all variables related with socio-economic factors and demographic factors regression models could be used. Logistic regression has been used to quantify the variation in the efficiency levels of selected types of farmers due to disease. Impact of diabetes on the farm work performance of laborer was measured through Poisson regression as it was employed by.[38]

Results

Table 2 depicts the outcomes of first model. Impact of diabetes on the working efficiency of farm laborers was assessed. The total number of absent work days (on monthly basis) was taken as dependent variable.

Table 3 reveals the logistic regression estimates for work efficiency loss of small farmers due to diabetes. The estimated results of logistic regression showed that coefficients of variable age of respondents (year), marital status of respondent, family size (number), family diabetes, balanced diet and time spent at farm (hour/day) have significant connotation with the dependent variable. Whereas, education (year) and time for delivery of

payment, timely or late, for their farm output (oftenly payment of sugarcane by mills to small farmers) has insignificant association with efficiency loss of small farmers with diabetes.

Table 4 demonstrates the outcomes of logistic regression for factor impacting the work performance of diabetic large farmers. The coefficient value for age (year) was positive, but insignificant, that is different from the coefficient value of age of small farmers (Table 2). It implies that the old age large farmers have more probability

Table 2. Regression Results for Less Availability of Laborer on Farm due to Diabetes

Variable	Coefficient	Standard Error	Z-score	p > Z
HHH	-0.988	0.122	-8.06	0.000*
Age	0.027	0.005	4.89	0.000*
Education	0.316	0.089	3.54	0.000*
Monthly earning	0.000016	3.77e-06	4.30	0.000*
Marital status	-0.254	0.0628	-4.04	0.000*
Family diabetes	0.072	0.0713	1.01	0.311
Leisure hours per day	0.137	0.01	13.37	0.000*
Constant	-1.886	0.28	-6.74	0.000*

Note: Log likelihood = -364.9, Prob > chi^2= 0.0000, Pseudo R2 = 0.45 (*significant at p-value < 0.01) (**significant at p-value < 0.05) (***significant at p-value < 0.1), HHH: Household head, p > Z: p-value > z-score

Table 3. Impact of Diabetes on the Work Performance of Small Farmers in the Study Area (Results of Logistic Regression)

Variable	Coefficient	Standard Error	Z-score	P > Z
Age	-0.043	0.021	-2.07	0.039**
Education	0.447	0.386	1.16	0.246
Marital status	0.95	0.552	1.72	0.085***
Family size	0.424	0.101	4.20	0.000*
Family diabetes	1.98	0.582	3.40	0.001*
Balanced diet	-1.893	0.639	-2.96	0.003*
HRFA	0.538	0.255	2.10	0.035**
DOP	-0.631	0.573	-1.10	0.271
Constant	-3.616	1.643	-2.20	0.028**

Note: Log likelihood = -57.71, Prob > chi^2= 0.0000, Pseudo R^2 = 0.33 (*significant at p-value < 0.01) (**significant at p-value < 0.05) (***significant at p-value < 0.1), HRFA: Avalibility of farmer at farm (hours per day), DOP: delivery of payment for sale of farm output, p > Z: p-value > z-score

Table 4. Impact of Diabetes on the Work Performance of Large Farmers in the Study Area (Results of Logistic Regression)

Variables	Coefficient	Standard Eror	Z-score	p > Z
Age	0.023	0.025	0.94	0.346
Education	0.214	0.433	0.49	0.621
Marital status	1.265	0.514	2.46	0.014*
Family diabetes	2.699	0.664	4.06	0.000*
Balance diet	-2.390	0.843	-2.84	0.005*
HRFA	1.553	0.365	4.25	0.000*
DOP	-1.714	0.582	-2.94	0.003*
Constant	-3.784	2.497	-1.52	0.130

Note: Log likelihood = -49.78, Prob > chi^2 = 0.0000, Pseudo R2 = 0.40 (*significant at p-value < 0.01) (**significant at p-value < 0.05) (***significant at p-value < 0.1), HRFA: Avalibility of farmer at farm (hours per day), DOP: delivery of payment for sale of farm output

of efficiency loss due to diabetes.

Discussion

Table 2 shows that coefficient of household head was different from zero and highly significant implying its negative association with the control variable. Household head with diabetes would have lower probability of leave of absence from farm due to diabetic health complexity. It supports the facts as household head have more financial responsibilities of his or her family, which is why they were attending the farm inspite of health problem.

These results are also consistent with the work of previous study.[30,38] Age could also impact the dependent variable according to the results. It means the old workers had less number of working days and these findings were in line with the results of other studies.[39] More important, the coefficient of education (schooling year) showed interesting results. It was different from zero and significantly implying that the workers with higher education would have more probability of having absent days that could be attributed to other possible sources of income. Monthly earning (Rupee) per month was also another important determinant that portrayed positive trend suggesting as income would increase that workers tend to attend more work days. It also supports the fact that an individual with more income would take more interest in his or her farm work.

In contrast, the marital status showed negative sign, inferring that a married workers would be more punctual in spite of disease. In the same way, coefficient of family diabetes records indicated positive sign, but it was insignificant statistically. Likewise, the Table 1 also shows another important result of variable leisure hours per day of workers. This value was positive and significant, demonstrating that rest time had also correlation with the control variable.

Table 3 shows that value of coefficient for age was negative, suggesting, loss of farm work efficacy would go down as age will increase. However, with an increase in the farmer's age, efficiency may also increase due to learning from previous farming experience. In the same way, education would have positive impact on work performance. In the same way results supported the fact that married respondents with more family size would have more probability of efficiency loss.[40] Likewise, positive coefficient values of family diabetes factor and availability at farm (hour/day) also showed positive link with efficiency reduction. As farmers spent less time at field due to hypoglycemia or other diabetic complexity, it increased their farm losses, especially in sowing and harvesting seasons. Balanced diet and timely delivery of payments would reduce the loss due to poor work performance.

Table 4 shows factor impacting the work performance of diabetic large farmers. Coefficient value of education was positive but insignificant, denoting its positive correlation with the loss in working efficiency. Likewise, findings revealed that selected variables like marital status, family with positive diabetes records and time spent by farmer at farm (hour / day) would have positive and significant association with the loss of farm work efficiency. These outcomes were consistent with the results of recent studies.[30] However, other factors, balanced diet and in time deliveries of revenues could have negative values but significant association with efficiency reduction. Sign of coefficient of age was positive for labor group and large farmers, while it was negative for the small farmers, showing farm work efficacy would increase as age will increase. In case of education, findings showed that for labor group, this variable would have significant impact on the dependent variables, however education does not showed significant impact for other both sample groups. Family diabetes history have had strong impact on the small and large farming groups and it showed insignificant impact on the labors.

Conclusion

Findings highlighted that these were the small growers who were facing highest monetary and no monetary losses due to diabetes. Although other two categories of farming groups e.g., farm workers and large farmers were suffering from socio-economic issues triggered by diabetes, but they have some alternative source for their survival. Laborer had alternative jobs and the large farmers had sufficient incomes. Small farmers have neither alternative source nor sufficient incomes for their socio-economic survival, and their whole dependence was on the farming. Diabetes and like diseases are increasing the vulnerabilities of these poor farming community who are already on the bench of poverty. Findings of the paper supported the fact that diabetes is decreasing the farm work efficiency in the agriculture sector. If patient farmers would have balanced diet and they receive agricultural payments of farm sales from sugar mills, and, grain and vegetable markets timely, then they were performing smoothly at farm inspite of diabetes. Study urged the need of stress management training workshop by government for the farming communities at union council level. Empowering strategies can induce basic changes in order to increase positive expectations, hope, self-esteem and self-confidence; this can be the exact strategy which could be used to efficiently control diabetes and its different types of complications among respondents. Type-I and II diabetes in Pakistan has been explored in many epidemiology and clinical studies, comparatively few have

studied the socio-economic background of issue, and none have focused on farming sector. Diabetes is a growing public health concern in the study area and disadvantaged rural areas are increasingly affected. Future study and action must continue to emphasize reducing structural inequities and empowering individuals to improve their quality of life by addressing social, physical, and mental aspects of health.

Abbreviations
HC: Human Capital; HHH: Household Head; GDP: Gross Domestic Product

Ethics Approval and Consent to Participate
Respondents were addressed before survey about the objectives and purposes of the survey, and verbal consent to participate in the study was taken from them.

Competing Interest
Author declares that there are no significant competing financial, professional, or personal interests that might have affected the performance or presentation of the work described in this manuscript.

Availability of Data and Materials
Research data can be provided upon request.

Authors' Contribution
Syed A A Naqvi and Bilal Husain: conceptualization; Syed A A Naqvi and Muhammad S A Makhdum: methodology; Rakshanda Kousar: writing - review and editing manuscript; Bilal Husain and Syed A R Shah: writing - original draft.

References

1. American Diabetes Association. Economic costs of diabetes in the US in 2012. diabetes care 2013; 36: 1033–1046. Diabetes Care. 2013; 36(6): 1797.

2. Basu S, Yoffe P, Hills N, Lustig RH. The relationship of sugar to population-level diabetes prevalence: an econometric analysis of repeated cross-sectional data. PloS one. 2013; 8(2): e57873.

3. Molloy JC, Barney JB. Who captures the value created with human capital? a market-based view. Academy of Management Perspectives. 2015; 29(3): 309-25.

4. Ford ND, Behrman JR, Hoddinott JF, Maluccio JA, Martorell R, Ramirez-Zea M, et al. Exposure to improved nutrition from conception to age 2 years and adult cardiometabolic disease risk: a modelling study. The Lancet Global Health. 2018; 6(8): e875-e84.

5. Chen L, Magliano DJ, Zimmet PZ. The worldwide epidemiology of type 2 diabetes mellitus—present and future perspectives. Nature Reviews Endocrinology. 2012; 8(4): 228.

6. Gray BJ, Bracken RM, Turner D, Morgan K, Thomas M, Williams SP, et al. Different type 2 diabetes risk assessments predict dissimilar numbers at 'high risk': a retrospective analysis of diabetes risk-assessment tools. British Journal of General Practice. 2015; 65(641): e852-e60.

7. Williamson R. Causes of diabetes. The Practitioner. 2009; 253(1718): 37-8.

8. Guariguata L, Whiting D, Weil C, Unwin N. The International Diabetes Federation diabetes atlas methodology for estimating global and national prevalence of diabetes in adults. Diabetes research and clinical practice. 2011; 94(3): 322-32.

9. Holman N, Young B, Gadsby R. Current prevalence of type 1 and type 2 diabetes in adults and children in the UK. Diabetic Medicine. 2015; 32(9): 1119-20.

10. Ogurtsova K, Guariguata L, Linnenkamp U, Fernandes JD, Cho NH, Makaroff LE. Regional differences in diabetes prevalence by age and urban/ rural setting. InDIABETES 2015 Jun 1 (Vol. 64, pp. A440-A440).

11. Belke M, Bolat S. The panel data analysis of female labor participation and economic development relationship in developed and developing countries. Economic Research Guardian. 2016; 6(2): 67-73.

12. Beard HA, Al Ghatrif M, Samper-Ternent R, Gerst K, Markides KS. Trends in diabetes prevalence and diabetes-related complications in older Mexican Americans from 1993–1994 to 2004–2005. Diabetes Care. 2009; 32(12): 2212-7.

13. Razavian N, Blecker S, Schmidt AM, Smith-McLallen A, Nigam S, Sontag D. Population-level prediction of type 2 diabetes from claims data and analysis of risk factors. Big Data. 2015; 3(4): 277-87.

14. Rivera LA, Lebenbaum M, Rosella LC. The influence of socioeconomic status on future risk for developing type 2 diabetes in the Canadian population between 2011 and 2022: differential associations by sex. International Journal for Equity in Health. 2015; 14(1): 101.

15. Sahoo K, Sethi N. Investigating the impact of agriculture and industrial sector on economic growth of India. OIDA International Journal of Sustainable Development. 2012; 5(5): 11-21.

16. Naik SS. India: key emerging market for hospitality industry. Trade & Commerce; 2012.

17. Khan MA. An explorative view on human resource management with focus on tourism & hospitality industry of India. Advances in Economics and Business Management; 2014.

18. Rosella LC, Mustard CA, Stukel TA, Corey P, Hux J, Roos L, et al. The role of ethnicity in predicting diabetes risk at the population level. Ethnicity & Health. 2012; 17(4): 419-37.

19. Zia-Ul-Haq M, Shahid SA, Ahmad S, Qayum M, Rasool N. Mineral contents and antioxidant potential of selected legumes of Pakistan. Journal of Medicinal Plants Research. 2012; 6(32): 4735-40.

20. Nguyen TT, Nguyen LD, Lippe RS, Grote U. Determinants of farmers' land use decision-making: comparative evidence from Thailand and Vietnam. World Development. 2017; 89: 199-213.

21. Loveridge R, Mok AL. Theories of labour market segmentation: a critique. Springer Science & Business Media; 2012.

22. Choudriuma A. Estimation of growth models for area, production and productivity of sunflower and groundnut crops in Karnataka: University of Agricultural Sciences GKVK, Bangalore; 2012.

23. Haddad EA, Porsse AA, Pereda PC. Regional economic impacts of cli-

mate anomalies in Brazil. Revista Brasileira de Estudos Regionais e Urbanos. 2013; 7(2): 19-33.

24. Odetola T, Etumnu C. Contribution of agriculture to economic growth in Nigeria. The 18th Annual Conference of The African Econometric Society (AES) Accra, Ghana; 2013.

25. Iftikhar S, Mahmood HZ. Human capital development and food security nexus: An empirical appraisal from districts of Punjab Province. Journal of Food and Drug Research. 2017; 1(1).

26. Hussain SA-FS-Z, editor. Effect of agricultural and financial sector reforms on export of cotton lint from Pakistan. International Conference On Applied Economics–ICOAE; 2010.

27. Memon NA. Rice: important cash crop of Pakistan. Pakistan Food Journal. 2013: 21-3.

28. Javed I, Ghafoor A. Determinants of rice export from Pakistan. Proceedings of the sixth international conference on management science and engineering management 2013 (pp. 793-801). Springer: London.

29. Boansi D, Lokonon BOK, Appah J. Co-integration analysis of the determinants of cotton lint exports from Mali. Asian Journal Agricultural Extension Economics and Sociology. 2014; 3(6): 544-61.

30. Arana ODS. La economía de los hogares: estudios sobre los efectos en la salud del uso de lena y sobre el mercado de trabajo rural en México. 2014.

31. Stabridis O, van Gameren E. Exposure to firewood: consequences for health and labor force participation in Mexico. World Development. 2018; 107: 382-95.

32. Kaiser A, Vollenweider P, Waeber G, Marques–Vidal P. Prevalence, awareness and treatment of type 2 diabetes mellitus in Switzerland: the CoLaus study. Diabetic Medicine. 2012; 29(2): 190-7.

33. Samuel-Hodge CD, Cene CW, Corsino L, Thomas C, Svetkey LP. Family diabetes matters: a view from the other side. Journal of General Internal Medicine. 2013; 28(3): 428-35.

34. Soulimane S, Simon D, Shaw J, Zimmet P, Vol S, Vistisen D, et al. Comparing incident diabetes as defined by fasting plasma glucose or by HbA1c. The AusDiab, Inter99 and DESIR studies. Diabetic Medicine. 2011; 28(11): 1311-8.

35. Larifla L, Maimaitiming S, Velayoudom-Cephise F-L, Ferdinand S, Blanchet-Deverly A, BenAbdallah S, et al. Association of 2238T> C polymorphism of the atrial natriuretic peptide gene with coronary artery disease in Afro-Caribbeans with Type 2 Diabetes. American Journal of Hypertension. 2012; 25(5): 524-7.

36. Wu J. Study applicable for multi-linear regression analysis and logistic regression analysis. Open Electrical & Electronic Engineering Journal. 2014; 8: 782-6.

37. Mallipedhi A, Min T, Prior SL, MacIver C, Luzio SD, Dunseath G, et al. Association between the preoperative fasting and postprandial C-peptide AUC with resolution of Type 2 Diabetes 6 months following bariatric surgery. Metabolism. 2015; 64 (11): 1556-63.

38. Karagöz A, Onat A, Aydın M, Can G, Şimşek B, Yüksel M. Distinction of hypertriglyceridemic waist phenotype from simple abdominal obesity: interaction with sex hormone-binding globulin levels to confer high coronary risk. Postgraduate Medicine. 2017; 129 (2): 288-95.

39. Mohamed SF, Mwangi M, Mutua MK, Kibachio J, Hussein A, Ndegwa Z, et al. Prevalence and factors associated with pre-diabetes and diabetes mellitus in Kenya: results from a national survey. BMC Public Health. 2018; 18(3): 1215.

40. Gregg EW, Zhuo X, Cheng YJ, Albright AL, Narayan KV, Thompson TJ. Trends in lifetime risk and years of life lost due to diabetes in the USA, 1985–2011: a modelling study. The Lancet Diabetes & Endocrinology. 2014; 2(11): 867-74.

Qualitative Exploration of Experiences and Consequences of Health-related Stigma among Indonesians with HIV, Leprosy, Schizophrenia and Diabetes

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Abstract

Health-related stigma causes a negative impact on the lives of affected people and undermines the effectiveness of public health programs. This study aimed to explore experiences and consequences of stigma among people affected by four health conditions relevant in Indonesia– HIV (Human Immunodeficiency Virus), leprosy, schizophrenia and diabetes. In this qualitative study 40 people affected by the four health conditions in Jakarta and West Java, Indonesia–, were interviewed between March and June 2018. Data were analyzed thematically by following an integrative inductive-deductive approach. The experiences and consequences of people with stigma were similar, but such experience were more severe among people affected by HIV, leprosy, and schizophrenia. Those with diabetes either experienced no or less severe stigma. The participants revealed that they experienced enacted stigma in healthcare, employment, and social interactions in the structural and interpersonal levels. They also experience the stigma in the form of internalized and anticipated stigma at an individual level. Incidences of human rights violations were evident. Social, behavioral, psychological, and medical consequences were also reported.

Keywords: diabetes, Human Immunodeficiency Virus, leprosy, schizophrenia, stigma Indonesia

Introduction

Health-related stigma is a global health issue that undermines the effectiveness of public health programs and negatively impact on the lives of affected people.[1] It affects people living with infectious diseases, such as HIV (Human Immunodeficiency Virus),[2] and leprosy,[3,4] and mental health conditions, such as schizophrenia.[5] It also affects people with noncommunicable diseases, including diabetes,[6,7] and cancers.[8,9] As a social phenomenon, stigma occurs within the society and usually depends on the nature of a disease.[10] People with communicable diseases, such as HIV or leprosy, experience stigma because of the infectious nature of diseases.[11,12] They are often blamed for having a transmissible disease and are avoided by others, especially when consequences of the condition are visible, as in leprosy.[4,11,13] People living with noncommunicable diseases, such as diabetes, are known to be blamed and shamed for their lifestyles and for inflicting the condition on themselves.[6,7] People living with chronic mental health conditions, such as schizophrenia are perceived to be aggressive and dangerous, so they are socially avoided and rejected.[5,14]

People with different health conditions experience stigma that negatively affects their social, physical, psychological, and spiritual well-being.[2,12,15] It reduces the degree of access and uptake of health care services, causing the underdiagnosis of conditions, failing to detect mental health issues, and delaying and disrupting treatment.[16-18] Such consequences of stigma affect preventive and treatment measures for eliminating these diseases, ultimately hampering advancements in decreasing the burden of diseases.[19,20]

Low-and middle-income countries (LMICs) are known to be disproportionately affected by health-related stigma because of the existence of subjugating social norms, lack of health awareness, and inequitable access to health services that contribute to stigma and its negative effects.[21,22] However, much of the burden of health-related stigma in LMICs still remains hidden and unaddressed because of the lack of wider recognition in health policies and practices.[21]

As the world's fourth-most populous developing nation currently in epidemiological transition with relatively high prevalence and distribution of noncommunicable and communicable diseases, Indonesia is particularly vulnerable to the burden of

stigma compared with other Southeast Asian countries.[23,24] It has the highest prevalence of HIV in the Southeast Asian region,[25] and leprosy has the third-highest prevalence in the world.[26] The prevalence of noncommunicable diseases, such as diabetes mellitus (6.7% in adults) and schizophrenia (around 1%), is high.[27,28] With a high burden and growing prevalence of these four diseases in the Indonesian society, these diseases have a social effect, that is, stigma and its experiences in the daily life of affected people.[20] In this regard, the stigma related to these four different diseases, which are relevant to the health of the Indonesian population, should be further explored and understood.

Few studies have reported the negative experiences of stigma among people with HIV,[29-34] and leprosy.[3,4,11,35-37] in Indonesia. Subu, *et al*.,[38] reported the stigma associated with mental illnesses, including schizophrenia in Indonesia. The Human Rights Watch,[39] published a report on the rampant human rights violations among people with schizophrenia and other mental illnesses in Indonesia. Two studies,[40,41] have reported the community perceptions of people with diabetes and the general experiences of persons living with diabetes in Indonesia. However, studies have focused on the stigma experiences of people with schizophrenia and diabetes. Furhtermore, the experiences of the stigma across different health conditions with different kinds of nature, etiology, and attribution, should be compared with record the differences and similarities among those experiences, particularly in the context of the Indonesian culture. Such insights not only help further understand the processes and experiences of stigma across different health conditions and within the specific Indonesian cultural context, but also have strong implications for public health programs in effectively responding to stigma in a variety of health conditions. Therefore, this study aimed to explore aimed to not only explore but also compare the experiences and consequences of stigma among people with HIV, leprosy, schizophrenia, and diabetes. The comparison was done among the four disease groups in order to see if there were any differences, however, the experiences and consequences were very similar across the groups.

Method

This study was a part of an exploratory community-based study on health-related stigma conducted in Jakarta and West Java in Indonesia between March and June 2018 among people living with/affected by four stigmatized health conditions, namely, HIV, leprosy, schizophrenia, and diabetes. The study locations were selected on the basis of the higher proportion of individuals with different health conditions in these

regions. The participants with HIV and diabetes were recruited in Jakarta, those with leprosy were recruited in Cirebon, West Java, and those with schizophrenia were recruited in Jakarta and Cianjur, West Java. Purposive convenience sampling was used to recruit participants from the community through referrals and recruitment by community-based organizations and peer-support groups related to the four different conditions. Those who were over the age of 16 years (age of consent) and who were willing and consented to participate were included in the study. Therefore, 40 participants (10 from each of the four health conditions) were recruited and interviewed.

Scambler's hidden distress model of stigma,[42] was used as a theoretical framework to develop the interview guide and analyze data. The framework categorized the experiences of stigma into two types: enacted (actual experiences of stigmatizing acts, attitudes, and behavior from others) and felt stigma (acceptance of stigmatizing social views and resultant feelings of shame [internalized stigma] and fear of being vilified because of the stigmatizing trait [anticipated stigma]).[43] These categories of stigma experiences are embedded within the socio-ecological levels where stigma exists at structural, interpersonal, and individual levels of the society.[5] Enacted stigma occurs at structural and interpersonal levels,[14,44] and felt stigma is experienced at the individual level.[14,45]

The interview guide was developed on the basis of the theoretical framework on Scambler's hidden distress model of stigma,[42] and multiple consultations with research experts (three from Athena institute, Vrije University Amsterdam, the Netherlands and two from the Faculty of Psychology, Atma Jaya Catholic University, Indonesia), and representatives from nongovernmental organizations and the different disease groups. Pilot interviews were first conducted with four participants (one from each health condition) to test the applicability and appropriateness of the interview guide and the interview technique. The interview guide included open questions on the experience of living with a stigmatized health condition, the experiences of stigma as a result of the health condition, and the resultant consequences of stigma. The interview guide was subsequently refined and adjusted by further outlining the questions on the experiences of stigma into structural (stigmatizing policies and systems in the society), interpersonal (stigma in family and social circles), and intrapersonal (self-perception of stigma) levels. The respondents were approached and asked to participate in the study. Those who agreed were either interviewed at their homes or in nongovernmental organization offices privately. The interviews started in an exploratory manner asking about the general daily experience of living with their health

condition, progressed toward more in-depth questions on specific examples of their personal experiences with stigma and its consequences, and lasted an average of one hour. In-depth probing was conducted until response saturation. Data were collected by a team of one Indonesian research associate from Vrije University Amsterdam and two research assistants from Atma Jaya Catholic University in Indonesia language under the supervision of the main researcher. The research team were trained on interview techniques and strategies for qualitative data collection prior to fieldwork (in the first week of March). Data were recorded electronically, transcribed verbatim, translated, managed, and analyzed with the qualitative software package *Atlas.ti*.

Data were analyzed through thematic content analysis,[46] and data were iteratively coded and thematically categorized using an integrative inductive-deductive approach,[47] to derive the inference. The transcripts were coded and thematically categorized into two, namely, experiences and consequences of stigma. The experiences of stigma were deductively categorized on the basis of the underpinning theory of Scambler's hidden distress model of stigma.[42] The codes were first categorized into three different socioecological levels, e.g., structural, interpersonal, and intrapersonal, levels, by using the deductive approach and then subcategorized into enacted stigma under the structural and interpersonal levels and felt stigma (internalized and anticipated) under the intrapersonal level. The consequences of stigma were inductively derived and categorized on the basis of the emerging themes: social, behavioral, psychological, and medical consequences. The analytical process was peer debriefed and discussed at each stage to ensure the quality and validity of codes, categories, and themes.

The study was approved by the Ethics Committee of Atma Jaya University (Approval ID: FR-UAJ-26-13/R0). Written consent was obtained from individual study participants. Refreshments were given to the participants and their transportation costs were refunded as a token of appreciation for their participation.

Results

A total of 40 participants, with ten each with HIV, leprosy, schizophrenia, and diabetes, were interviewed. Of these participants, 21 were females (52.5%), 18 were males (45.0%), and 1 was a transgender (2.5%). The median age of the participants was 40.9 years (Standard Deviation 11.54) with an age range of 19 - 75 years. The mean duration of living with/having had the condition was 10.4 years (SD 5.8) with a range of 1 - 25 years. In terms of ethnicity, the majority (40%) of the participants were Javanese, followed by Sundanese (20%), Chinese (15%), and others (25%). Most of the participants were Muslims (62.5%), and the remaining participants were Christians (32.5%) and Buddhists (5.0%). The majority of the participants reached the senior high school level or higher (82.5%), and were employed (76.3%).

The key themes of the experiences of stigma and its consequences are presented in Figure 1. The experiences were deductively categorized into three different levels as per the socioecological level framework, e.g., structural, interpersonal, and intrapersonal levels. Participants experienced two distinct types of stigma, namely, the enacted stigma that manifested at structural and interpersonal levels, and felt stigma which manifested in the individual level. The experiences of stigma were reported at multiple levels of the society by all the participants affected by HIV, leprosy, and schizophrenia. Only six participants with diabetes reported that they experienced stigma, whereas four participants did not perceive any stigma because of their
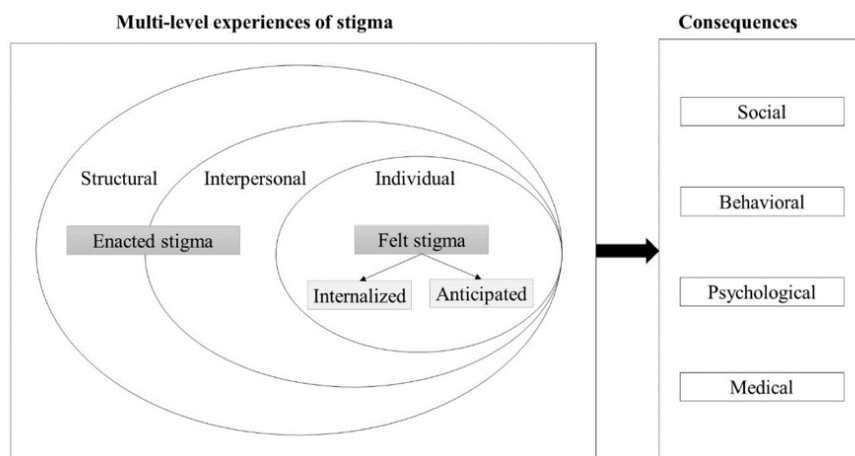

Figure 1. Key Themes of Experiences of Stigma and Its Consequences

condition.

The participants reported of experiencing enacted stigma because of existing policies and practices, and social and cultural norms at the structural level. People living with HIV and schizophrenia reported exclusionary policies and practices in health institutions. For example, participants with HIV reported that they were denied of treatment or refused to receive treatment after they knew their HIV status, were allowed in-house hospital admissions only in private rooms, and used overt practices to avoid contamination. Some participants with HIV and schizophrenia also reported severe human rights violations because of hospital policies. For example, one woman living with HIV recounted her experience of the hospital administration handing her a consent form for sterilization to sign right before the delivery of her child,

"I was in a position where I could not refuse. I was only 22 years old then (in 2008). At first, I did not want to do it, but the doctor said if I did not want to (sign the consent form), he would not operate. I had my first child at 22 years old and got sterilized." (Female, HIV, AH010)

Three people with schizophrenia talked about their experience of involuntary captivity and isolation practiced in a hospital as a way to subdue patients.

The participants reported that they experienced exclusionary policies in the job market. Three participants with diabetes indicated that they experienced discrimination in jobs that involved physical labor or heavy workload, which they were either not hired or excluded from participating because of their disease. People affected by leprosy with visible spotting or deformity stated problems in having a job in public and private sectors. Those who have HIV and schizophrenia and disclose their health status reported that they were rejected or dismissed from jobs. Most participants affected by HIV, leprosy, and schizophrenia stated their preference to either work in non-governmental organizations (NGOs) related to their respective health condition or open their own business to avoid stigma. Several people with schizophrenia reported that they worked as *Go-Jek* (online motorbike ride sharing service in Indonesia) drivers to minimize interactions with the employers and colleagues.

The participants also talked about how poverty further impacted their experience of stigma. They reported that the lack of finances limited their access to health care, thereby worsening their condition and its manifestations. One participant with HIV called it "double stigma" of being "sick" and "poor." However, some participants also talked about how some improvements are happening, such as *BPJS* (Indonesian National Health Insurance), which helps them and other poor people avail inexpensive medical treatment.

The participants also reported that they had adverse experiences of stigma because of existing socio-cultural, religious, and gender norms. People with/affected by HIV, leprosy, and schizophrenia reported that religious, superstitious, and mystical beliefs in the society, such as sin or bad deeds, curses, witchcraft, and influence of evil spirits, were the cause of their diseases. They also talked about how socially held stereotypes played a role in stigmatizing individuals with diseases. Those with HIV and leprosy also reported the fear of people about contracting the disease from them because of their lack of knowledge. The participants living with schizophrenia reported that the society perceived people with schizophrenia as "crazy" or "aggressive", leading to stigmatization and discriminatory practices against them. Three participants recounted their experience of being tied and shackled, which is an act called *"pasung"* in Indonesian, to restrain them. On the contrary, people with diabetes reported that they received support and acceptance from the society. They stated how diabetes was considered "normal" in the Indonesian society because many people in the community were more familiar with the disease. Four female participants with HIV and three with diabetes described how women were judged more harshly than men in the society and recounted of being considered irresponsible and vilified for making "bad decisions."

The participants described their experiences of stigma at an interpersonal level from health care professionals, friends, and family. All the participants except those with diabetes, reported their negative experiences with healthcare professionals. They were either discriminated against or disrespected because of their disease. The participants affected by leprosy reported that health care staff refrained from touching them; for instance, health care people would not shake hands with them. The participants with schizophrenia commented on feeling condescended by how healthcare workers treated them and talked to them—they felt like they were not adults or in control of their life. Those with HIV talked about how some health workers did not value and respect the knowledge, experiences, and views of patients. One participant said,

"In this day and age, health care workers still think that they are the only ones with knowledge (on HIV-related issues) because they went to medical school. I rarely find a doctor who wants to accept inputs from us." (Female, HIV, AH013)

Most participants talked about experiencing stigma and discrimination from family and friends. The participants reported that they were ridiculed and harassed by friends. Three participants affected by leprosy reported that they were being shunned because of visible spotting or deformity and called "ugly." One participant living with schizophrenia described how his

friends saw him take his medicine and told everybody he was using "*drugs (narcotics)*". The participants with diabetes reported how friends and family intervened while they were eating and either stopped them or shamed them for eating unhealthy. Some participants reported that they felt stigmatized because of interference, but most of them considered the act as caring and considerate and did not feel stigmatized.

The participants affected by HIV, leprosy, and schizophrenia particularly talked about how their family felt ashamed and embarrassed because of their disease. They described how their families were fearful of others knowing about their disease and tried to conceal it from others. The participants also reported about the exclusionary behavior from their family members. One participant with HIV talked about how people in his family separated all kitchen utensils used by him and disinfected his bedding and clothes. The participants with schizophrenia reported that they were excluded from family discussions or important decision making. One participant said,

> "I was never involved in any important occasion at my home. For instance, during my nephew's wedding, I was not involved to make any decisions. They did not trust me." (Male, Schizophrenia, SS004)

The participants reported that they felt stigma at an individual level in the form of internalization and anticipation of stigma. They described the internalized stigma in the form of acceptance and self-endorsement of negative stereotypes, shame, self-blame, and self-deprecation. Some participants affected by leprosy and schizophrenia reported that they agreed with and accepted the cultural and religious beliefs that their condition was because of their "sin," "curses," and "bad spirits." The participants also reported that they identified with negative stereotypes associated with health conditions. One man with schizophrenia said,

> "I felt really down to know that I was mentally ill and was worried if I would ever be able to get better. Everybody knows that having schizophrenia equal to being mentally ill." (Male, Schizophrenia, SS009)

Most participants affected by HIV, leprosy, and schizophrenia were also embarrased for having the disease and feeling useless. Some participants living with HIV and diabetes reported that they blamed themselves for their condition. Those living with HIV blamed themselves for their past behavior that led them to have HIV. Two participants with diabetes talked about how they blamed their eating habits and lifestyle for their condition.

The participants also reported that they experienced anticipation and fear that they might experience negative stigmatizing attitudes from others. The participants who disclosed their health conditions expressed their impending fear of stigma and discrimination in the future. People affected by HIV, leprosy, and schizophrenia talked about their fear of people distancing themselves from them or being excluded from social settings if their health conditions were disclosed. One participant with diabetes talked about how she was scared of being pitied or ridiculed for having the disease and people might start attributing the condition to their weight, eating habits, or lifestyle choices.

According to the participants' responses, the consequences of stigma were inductively categorized into four distinct categories, that were social, behavioral, psychological, and medical consequences. Most participants talked about social consequences, which primarily constituted of strained or severed relationships with friends and family, damaged reputation and social standing in the community, and limited work opportunity and career progression. Most participants with schizophrenia talked about how their relationships with their family and friends deteriorated because of their condition. One participant with schizophrenia recounted how his wife left him. Another participant talked about how his fiancée cancelled their wedding and broke up with him after knowing his condition. Most participants affected by HIV, leprosy, and schizophrenia talked about how their social standing and reputation were tarnished because of their disease status. Many participants, including two with diabetes, reported that their disease condition limited their prospects of having jobs or hampered chances of career progression or promotion in their existing jobs.

The participants reported that they encountered behavioral consequences that included shutting themselves off from their friends, family, and the society by either concealing their health condition or isolating themselves from the society. They also reported psychological consequences, including stress, anxiety, severe depression, and suicidal ideation. People living with schizophrenia and HIV reported psychological consequences the most. Those with schizophrenia reported the most instances of suicidal ideation and attempts, and those with HIV described stress, anxiety, and depressive symptoms as a result of stigma.

Participants affected by HIV, leprosy, and schizophrenia talked about two specific medical consequences, such as avoiding medical care and disrupting treatment. People living with HIV and schizophrenia talked about how stigma experienced in the healthcare settings deterred them from visiting certain health facilities or had to trasnfer to another hospital or change their doctors. Those affected by leprosy and schizophrenia talked about how stigma disrupted their treatment and adherence to medication. They described how superstitious beliefs made them leave their medical treatment and seek

alternative treatment from faith healers, shamans, and witchdoctors. One participant affected by leprosy talked about how disrupting his treatment led to his disability,

> *"I was taking medicine (for leprosy), but because we (my family and I) all thought I was cursed, I stopped my medicine and consulted a faith healer instead. Now, I have a deformity in my leg." (Male, Leprosy, AK004)*

Discussion

This study explored the experiences of stigma among people living with/affected by HIV, leprosy, schizophrenia, and diabetes in Indonesia. The experiences and consequences of stigma were similar, but such consequences were more severe among people with HIV, leprosy, and schizophrenia. Those with diabetes either experienced no or less severe stigma. The experiences of stigma were evident in all three socio-ecological levels in the Indonesian society. Enacted stigma was experienced in health care, employment, social interactions, and within families at structural and interpersonal levels, and felt stigma in the form of internalized and anticipated stigma was reported at an individual level. The incidences of human rights violations were evident. The social, behavioral, psychological, and medical consequences of stigma were identified.

Even though the health conditions were different in nature and etiology, the experiences and consequences of stigma were similar. This finding was consistent with the works of Rao,[10] and Van Brakel,[48] who emphasized that the experiences of stigma associated with them were mostly the same despite the different characteristics, attributions, and origins of diseases. Studies on stigma have also found that the severity and intensity of such experiences may differ in terms of disease condition even though the experiences of stigma are similiar.[22,49,50] This finding was evident from the study findings, which showed that people with diabetes experienced either no or less severe form of stigma compared with those with the three other conditions. Their experiences were mostly limited to judgments and comments from people around them. Even then, some of the affected people did not perceive such behavior as stigmatizing; instead, they believed that this behavior was a supportive and caring gesture for the good of their own health. This might have to do with the normalization of diabetes in the Indonesian society because of its higher prevalence and wider existence, considering that many families have members living with the condition.[40,41] Pitaloka and Hseih,[40] reported that Javanese women with diabetes perceived their condition as a normal part of their daily lives and considered it to be an ordinary illness that was not severe. A study conducted in Central Java, Indonesia showed that diabetes is largely hereditary, and other people em-

pathized with those who had the condition, even though the public had a negative perception about diabetes as a terrifying disease without cure and blamed people with diabetes for their dietary habits and sedentary lifestyle.[41]

For people with HIV, leprosy, and schizophrenia, the experiences of stigma were more severe and damaging. As the world's most populous Muslim-majority country, Indonesia not only has Islamic traditions and practices, but also has deeply rooted superstitious traditions and practices embedded in the local culture that can exacerbate stigma of these three diseases.[4,51,52] Islamic law prohibits homosexuality, extramarital sex, and the drug use, which force stigma and human rights violations toward people living with HIV that belong to the vulnerable groups.[51,53] Leprosy in Indonesia is often considered a result of black magic, curse, or sinful deeds in impoverished communities where superstitious beliefs are prevalent.[4] In case of schizophrenia, medical treatment opportunities are limited in rural areas in Indonesia, and people often resort to age-old practices, such as *pasung* (shackling of people with schizophrenia to subdue them), which violate the human rights of those affected.[39,54] People also attribute schizophrenia to possession by evil spirits or God's punishment, and consider *pasung* as the only way to cure diseases by confining a person until he/she becomes free of evil spirits.[54,55] The stigmatization of these conditions is unfortunately driven by cultural traditions and norms, existing exclusionary policies and practices in healthcare and employment sectors,[11,38,39] and by societal actors - healthcare workers, friends, family, and neighbors,[38,56] which corroborate the findings of this study. Consistent with the study findings, the experiences of felt stigma through internalization and anticipation of stigma are further known to intensify self-stigmatization.[3,29,38] Lusli, *et al.*,[3] found that Indonesians with leprosy usually internalize the shame and endorsement of the negative stereotype of having this condition. The internalization of shame was also reported in a study conducted in Indonesia among people living with schizophrenia and other mental illnesses.[38] Culbert, *et al.*,[29] reported about the fear of stigma among prisoners with HIV in Indonesia, and this condition affects their decision to disclose their condition to others.

The consequences of stigma were similar to those reported from other studies on stigma globally, including social consequences (e.g., isolation and severed relationship),[11,57], behavioral consequences (such as nondisclosure or concealment),[19,35] psychological consequences (such as stress, anxiety, depression and suicidal ideation),[6,58] and medical consequences (such as delay or disruption of treatment).[3,18,20,59] Studies have indicated that such consequences have an impact on the overall quality of life of individuals.[2,15,59]

Furthermore, they undermine the public health response and cause a negative impact on their overall effectiveness.[18,19,21]

The findings of this study have several implications for public health research and practice in Indonesia. First, the prospects of stigma reduction response at different levels of the society are clear. Studies should focus on structural and interpersonal levels to minimize enacted stigma; efforts to changing exclusionary policy, practices, and social norms and raising awareness and knowledge to change public perception of the diseases can be effective. For felt stigma at an individual level, specific interventions, such as psychosocial support and peer counseling, may help. Second, the findings have highlighted the importance of understanding and respecting the living experiences, experiential knowledge, and rights of people with health conditions. The findings warrant a paradigm change from a traditional medical approach in which affected people are considered "patients" or "beneficiaries" to a human rights-based approach in which patients are recognized as equals and key stakeholders with rights and ability to make decisions on issues that affect their lives at every level of the society. Third, considering the similarity in the experiences and consequences of stigma under the four conditions, the strongest approach in effectively responding to health-related stigma in the society might involve the combination of these different stigmatized health conditions and their shared experiences, knowledge, and lessons learned. However, researchers should study the feasibility and prospects for such an integrated and common stigma reduction intervention. Fourth, while responding to health-related stigma, individual differences (e.g., comorbidity, disease severity, etc.) should be acknowledged. Other social inequalities and oppressions that shape a person's experience of stigma, such as gender and poverty, should be considered. A further study is needed to identify the most important factor that intersects with health-related stigma, and to design interventions that address these different inequalities along with health-related stigma, to effectively reduce stigma. Fifth, the findings indicated an integral role of the government in forging an alliance with advocacy groups, civil society, and NGOs to replace exclusionary policies and practices and to fight superstitious customs and traditions. Further, the instances of human rights violations also warrant government intervention to ensure all individuals with diseases protected. Another role of the government can include leveraging interagency collaboration to tackle stigma by integrating and uniting response previously siloed into different diseases and disciplines.

This study also has some limitations. This study only presents a general outline of stigma experiences and consequences, to streamline the scope of research findings, but this study does not delve deeper into individual differences that may affect the experience and severity of stigma, such as disease severity, duration of living with the disease, disability, comorbidity, poverty, gender, sexuality, and age. Furthermore, this the study only focuses on the negative experiences of stigma and exclusion, while positive experiences of coping, resilience, and inclusion despite stigma were excluded.

Conclusion

People living with HIV, leprosy and schizophrenia still face stigma and its adverse impact on the different facets of the Indonesian society. Those with diabetes either perceive no or less severe stigma. Exclusionary policies and practices, subjugating social norms, superstitious beliefs, and shame, blame and fear from societal actors cause the negative experiences of stigma among affected persons. They experience the social, behavioral, psychological, and medical consequences of stigma. The findings suggest a need for changes in policies and practices to prevent exclusion and human rights violation of stigmatized people and to combine advocacy efforts and public health responses to different diseases in an integrative united front to end stigma.

Authors' Contribution
Sarju Sing Rai, Irwanto, Ruth M H Peters, Elena V Syurina & Marjolein B M Zweekhorst were involved in the design and conceptualization of the study; Sarju Sing Rai, Annisa Ika Putri & Altana Mikhakhanova were involved in data collection; Sarju Sing Rai, Irwanto, Ruth M H Peters, Elena V Syurina, Annisa Ika Putri & Altana Mikhakhanova were involved in data analysis, discussed the final results and con-

tributed to the final manuscript.

Additional Information
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References

1. Hatzenbuehler ML, Phelan JC, Link BG. Stigma as a fundamental cause of population health inequalities. American Journal of Public Health. 2013; 103(5): 813-21.

2. Holzemer WL, Human S, Arudo J, Rosa ME, Hamilton MJ, Corless I, et al. Exploring HIV stigma and quality of life for persons living with HIV infection. Journal of the Association of Nurses in AIDS Care. 2009; 20(3): 161-8.

3. Lusli M, Zweekhorst MB, Miranda-Galarza B, Peters RM, Cummings S, Seda FS, et al. Dealing with stigma: experiences of persons affected by disabilities and leprosy. BioMed Research International. 2015; 2015: 261329.

4. Peters RM, Dadun, Lusli M, Miranda-Galarza B, van Brakel WH, Zweekhorst MB, et al. The meaning of leprosy and everyday experiences: an exploration in Cirebon, Indonesia. Journal of Tropical Medicine. 2013; 2013: 507034.

5. Knaak S, Mantler E, Szeto A. Mental illness-related stigma in healthcare: barriers to access and care and evidence-based solutions. Healthcare Management Forum. 2017; 30(2): 111-6.

6. Browne JL, Ventura A, Mosely K, Speight J. 'I call it the blame and shame disease': a qualitative study about perceptions of social stigma surrounding type 2 diabetes. BMJ Open. 2013; 3(11): e003384.

7. Schabert J, Browne JL, Mosely K, Speight J. Social stigma in diabetes: a framework to understand a growing problem for an increasing epidemic. Patient. 2013; 6(1): 1-10.

8. Cataldo JK, Brodsky JL. Lung cancer stigma, anxiety, depression and symptom severity. Oncology. 2013; 85(1): 33-40.

9. Else-Quest NM, LoConte NK, Schiller JH, Hyde JS. Perceived stigma, self-blame, and adjustment among lung, breast and prostate cancer pa-

10. Rao PS. Study on differences and similarities in the concept and origin of leprosy stigma in relation to other health-related stigma. Indian Journal of Leprosy. 2010; 82(3): 117-21.

11. van Brakel WH, Sihombing B, Djarir H, Beise K, Kusumawardhani L, Yulihane R, et al. Disability in people affected by leprosy: the role of impairment, activity, social participation, stigma and discrimination. Global Health Action. 2012; 5.

12. Turan B, Hatcher AM, Weiser SD, Johnson MO, Rice WS, Turan JM. Framing mechanisms linking HIV-related stigma, adherence to treatment, and health outcomes. American Journal of Public Health. 2017; 107(6): 863-9.

13. Sermrittirong S, Van Brakel WH. Stigma in leprosy: concepts, causes and determinants. Leprosy Review. 2014; 85(1): 36-47.

14. Brohan E, Slade M, Clement S, Thornicroft G. Experiences of mental illness stigma, prejudice and discrimination: a review of measures. BMC Health Services Research. 2010; 10: 80.

15. Gredig D, Bartelsen-Raemy A. Diabetes-related stigma affects the quality of life of people living with diabetes mellitus in Switzerland: implications for healthcare providers. Health & Social Care in the Community. 2017; 25(5): 1620-33.

16. Corrigan PW, Rao D. On the self-stigma of mental illness: stages, disclosure, and strategies for change. Canadian Journal of Psychiatry. 2012; 57(8): 464-9.

17. Farley-Toombs C. The stigma of a psychiatric diagnosis: prevalence, implications and nursing interventions in clinical care settings. Critical Care Nursing Clinics of North America. 2012; 24(1): 149-56.

18. Katz IT, Ryu AE, Onuegbu AG, Psaros C, Weiser SD, Bangsberg DR, et al. Impact of HIV-related stigma on treatment adherence: systematic review and meta-synthesis. Journal of the International AIDS Society. 2013; 16 (3 Suppl 2): 18640.

19. Kane JC, Elafros MA, Murray SM, Mitchell EMH, Augustinavicius JL, Causevic S, et al. A scoping review of health-related stigma outcomes for high-burden diseases in low- and middle-income countries. BMC Medicine. 2019; 17(1): 17.

20. Stangl AL, Earnshaw VA, Logie CH, van Brakel W, L CS, Barre I, et al. The health stigma and discrimination framework: a global, cross-cutting framework to inform research, intervention development, and policy on health-related stigmas. BMC Medicine. 2019; 17(1): 31.

21. Kemp CG, Jarrett BA, Kwon CS, Song L, Jette N, Sapag JC, et al. Implementation science and stigma reduction interventions in low- and middle-income countries: a systematic review. BMC Medicine. 2019; 17(1): 6.

22. Thornicroft G, Mehta N, Clement S, Evans-Lacko S, Doherty M, Rose D, et al. Evidence for effective interventions to reduce mental-health-related stigma and discrimination. Lancet. 2016; 387(10023): 1123-32.

23. Institute for Health Metrics. GBD profile: Indonesia. IHME, University of Washington; 2010 [updated 2018 Feb 20].

24. Vos T, Barber RM, Bell B, Bertozzi-Villa A, Biryukov S, Bolliger I, et al. Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. The Lancet. 2015; 386 (9995): 743-800.

25. The Joint United Nations Programme on HIV/AIDS. Indonesia 2017; 2018.

26. World Health Organization. Global leprosy update, 2017: Reducing the disease burden due to leprosy 2017 [updated 2018 Aug 24].

27. International Diabetes Federation. Prevalence of Diabetes in Indonesia 2017 [updated 2018 May 12]; 2017.

28. Indonesian Ministry of Health. Riset Kesehatan Dasar 2013 [updated 2014 Feb 13]; 2014.

29. Culbert GJ, Earnshaw VA, Wulanyani NM, Wegman MP, Waluyo A, Altice FL. Correlates and experiences of HIV stigma in prisoners living with HIV in Indonesia: a mixed-method analysis. Journal of the Association of Nurses in AIDS Care. 2015; 26(6): 743-57.

30. Nurfalah F, Yona S, Waluyo A. The relationship between HIV stigma and adherence to antiretroviral (ARV) drug therapy among women with HIV in Lampung, Indonesia. Enfermería Clínica; 2019.

31. Irmayati N, Yona S, Waluyo A. HIV-related stigma, knowledge about HIV, HIV risk behavior and HIV testing motivation among women in Lampung, Indonesia. Enfermería Clínica; 2019.

32. Sianturi EI, Perwitasari DA, Islam MA, Taxis K. The association between ethnicity, stigma, beliefs about medicines and adherence in people living with HIV in a rural area in Indonesia. BMC Public Health. 2019; 19(1): 55.

33. Victoryna F, Yona S, Waluyo A. The relationship between stigma, family acceptance, peer support and stress level among HIV-positive men who have sex with men (MSM) in Medan, North Sumatera, Indonesia. Enfermería Clínica; 2019.

34. Desyani NLJ, Waluyo A, Yona S. The relationship between stigma, religiosity, and the quality of life of HIV-positive MSM in Medan, Indonesia. Enfermería Clínica. 2019.

35. Peters RMH, Hofker ME, van Brakel WH, Marjolein ZBM, Seda FSSE, Irwanto I, et al. Narratives around concealment and agency for stigma-reduction: a study of women affected by leprosy in Cirebon District, Indonesia. Disability, CBR & Inclusive Development. 2014; 25(4).

36. Dadun D, Peters R, Lusli M, Miranda-Galarza B, van Brakel W, Zweekhorst M, et al. Exploring the Complexities of leprosy-related stigma and the potential of a socio-economic Intervention in a public health context in Indonesia. Disability, CBR & Inclusive Development. 2016; 27(3).

37. Lusli M, Peters R, van Brakel W, Zweekhorst M, Iancu S, Bunders J, et al. The impact of a rights-based counselling intervention to reduce stigma in people affected by leprosy in Indonesia. PLoS Neglected Tropical Diseases. 2016; 10(12): e0005088.

38. Subu MA. Persistent taboo understanding mental illness and stigma among Indonesian adults through grounded theory. Université d'Ottawa/University of Ottawa; 2015.

39. Human Rights Watch. Living in Hell: Abuses against People with Psychosocial Disabilities in Indonesia. USA: Human Rights Watch; March 2016 [updated 2016 Mar 16].

40. Pitaloka D, Hsieh E. Health as submission and social responsibilities: embodied experiences of Javanese women with Type II Diabetes. Qualitative Health Research. 2015; 25(8): 1155-65.

41. Pujilestari CU, Ng N, Hakimi M, Eriksson M. "It is not possible for me to have Diabetes"-community perceptions on Diabetes and its risk factors in Rural Purworejo District, Central Java, Indonesia. Global Journal of Health Science. 2014; 6(5): 204-18.

42. Scambler G. Re-framing stigma: felt and enacted stigma and challenges to the sociology of chronic and disabling conditions. Social Theory & Health. 2004; 2(1): 29-46.

43. Weiss MG. Stigma and the social burden of neglected tropical diseases. PLoS Neglected Tropical Diseases. 2008; 2(5): e237.

44. Hatzenbuehler ML. Structural stigma: research evidence and implications for psychological science. American Psychologist. 2016; 71(8): 742-51.

45. Livingston JD, Boyd JE. Correlates and consequences of internalized stigma for people living with mental illness: a systematic review and meta-analysis. Social Science & Medicine. 2010; 71(12): 2150-61.

46. Weber RP. Basic content analysis. 2 nd ed. London: Sage Publications Ltd; 1990.

47. Fereday J, Muir-Cochrane E. Demonstrating rigor using thematic analysis: a hybrid approach of inductive and deductive coding and theme development. International Journal of Qualitative Methods. 2006; 5(1): 80-92.

48. van Brakel WH, Cataldo J, Grover S, Kohrt BA, Nyblade L, Stockton M, et al. Out of the silos: identifying cross-cutting features of health-related stigma to advance measurement and intervention. BMC Medicine. 2019; 17(1): 13.

49. Ebneter DS, Latner JD. Stigmatizing attitudes differ across mental health disorders: a comparison of stigma across eating disorders, obesity, and major depressive disorder. The Journal of Nervous and Mental Disease. 2013; 201(4): 281-5.

50. Pachankis JE, Hatzenbuehler ML, Wang K, Burton CL, Crawford FW, Phelan JC, et al. The burden of stigma on health and well-being: a taxonomy of concealment, course, disruptiveness, aesthetics, origin, and peril across 93 stigmas. Personality and Social Psychology Bulletin. 2018; 44(4): 451-74.

51. Suhardjo K, Irwanto. Tumbuh bagai ilalang: perjalanan transformatif dalam diskriminasi dan kekesaran – studi deskriptif proses belajar transformatif waria dan gay pekerja seks di Jakarta. Jakarta: Universitas Katolik Indonesia Atma Jaya; 2018.

52. Triawan AdR. Jadi, kau tak merasa bersalah!? Studi kasus diskriminasi dan kekerasan terhadap LGBTI. Jakarta: Arus Pelangi; 2018.

53. Uddin AT. Religious freedom implications of sharia implementation in Aceh, Indonesia. University of Saint Thomas Law Journal. 2010; 603.

54. Laila NH, Mahkota R, Krianto T, Shivalli S. Perceptions about pasung (physical restraint and confinement) of schizophrenia patients: a qualitative study among family members and other key stakeholders in Bogor Regency, West Java Province, Indonesia 2017. International Journal of Mental Health Systems. 2018; 12: 35.

55. Irmansyah I, Prasetyo YA, Minas H. Human rights of persons with mental illness in Indonesia: more than legislation is needed. International Journal of Mental Health Systems. 2009; 3(1): 14.

56. Nurjannah I, FitzGerald M, Foster K. Patients' experiences of absconding from a psychiatric setting in Indonesia. International Journal of Mental Health Nursing. 2009; 18(5): 326-35.

57. Rose D, Willis R, Brohan E, Sartorius N, Villares C, Wahlbeck K, et al. Reported stigma and discrimination by people with a diagnosis of schizophrenia. Epidemiology and Psychiatric Sciences. 2011; 20(2):

193-204.

58. Herek GM, Saha S, Burack J. Stigma and psychological distress in people with HIV/AIDS. Basic and Applied Social Psychology. 2013; 35(1): 41-54.

59. Lustosa AA, Nogueira LT, Pedrosa JI, Teles JB, Campelo V. The impact of leprosy on health-related quality of life. Revista da Sociedade Brasileira de Medicina Tropical. 2011; 44(5): 621-6.

Health Risk Behaviors: Smoking, Alcohol, Drugs, and Dating among Youths in Rural Central Java

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Abstract

Adolescents are more likely to adopt risky health behaviors, such as smoking, alcohol use, and sexual activity. This study examined the links between smoking, alcohol use, and risky dating behavior and analyzed how these factors influenced risky dating and other behaviors. It is expected that this study would be used as a foundation for developing appropriate integrated intervention for multiple risk behaviors among youths. This study was an explanatory research study with a cross-sectional approach. It involved 160 youths aged 15-24 years randomly selected from purposive villages. Participants completed self-administrated questionnaires with an enumerator present. Data were analyzed using univariate, chi-square, and multiple logistic regression. Smoking behavior, leisure activity, and self-efficacy were predictors of risky dating behavior. The self-efficacy variable also influenced multiple risk behaviors. A strong association was found between smoking, risky dating behavior, and alcohol use. One-third of the participants had dated and smoked recently, but only 10% of them had experienced high-risk dating activity, including petting and intercourse. Only 5% had experienced alcohol use (in particular, traditional alcohol), and no one admitted being involved with drug abuse.

Keywords: alcohol use, dating behavior, drugs, smoking, youth

Introduction

Adolescence is a period of rapid physical and psychological growth and development. During this time frame, young people show great curiosity and love for challenging adventures and tend to take risks without considering the consequences. The fact that young people are naturally less control of their emotions makes it easy for them to fall into unhealthy behaviors or lifestyle.[1]

Based on the 2012 Indonesia Demographic and Health Survey data, approximately 33.3% of girls and 34.5% of boys aged 15 – 19 began dating before the age of 15. Unwanted pregnancy and sexually transmitted diseases are risks of premarital sexual behaviors among youth. Unwanted pregnancy in young women create the risk of abortion and teenage marriage. Both implicate the future of adolescents' health and their infants. Indonesia has the 37th highest percentage of young marriages. Early marriages are risky because youth are unprepared physically, psychologically, and mentally to build new families.[2]

Youth also often participate in other unhealthy behavior, including smoking, alcohol use, and drug abuse.[3] In Indonesia, the number of current smokers rose from 7% in 2015 to 8.8% in 2016. Ministry of Health data shows that the prevalence of 15-year-old smokers in Indonesia increased to 36.3%, compared to only 27% in 1995.[4] This means that Indonesia is the country with the the most third-hand smoke. Because smoking is allowed everywhere, residual nicotine and other chemicals are left behind on clothing and indoor surfaces, causing a potential threat to family and working environments health.[5] Many adolescents are familiar with cigarettes from elementary school or even earlier. The number of adolescents who start smoking cigarette in Indonesia is alarming and certainly has impact on health and quality of life for the younger generations.[6] While, for alcohol consumption among youth, 3.3% of them start drinking at the age of 10, mostly traditional alcohol drinks (38.7%). In Central Java, the proportion in 2018 was higher than in 2017.[4]

In addition, in 2014, injecting drug use also contributed 7.7% to the number of human immunodeficiency virus and acquired immune deficiency syndrome (HIV/AIDS) cases in Indonesia. Although this

figure is lower than in the previous years, it is considered as iceberg phenomenon that needs prevention as early as possible. This is because most AIDS sufferers are infected with HIV when they are still adolescents.[7]

The Indonesian Ministry of Health launched the "*ABAT*" (I Proud I Know) program in 2013 aimed at preventing HIV/AIDS among adolescents. This program targets youths aged 15–24 years to elevate their knowledge and awareness of HIV/AIDS, particularly how it can be transmitted through unsafe sex and injecting drug use.[8] The National Population and Family Planning Board or *Badan Kependudukan dan Keluarga Berencana Nasional* (*BKKBN*) developed the *GenRe* (Planning Generation) program for unmarried adolescents aged 10–24 years and families and communities who care about them. This program provides information about reproductive health and the risks of early marriage, pre-marital sex, and alcohol and drug use. By promoting healthy life skills and adolescents' self-concept, the program hopes to encourage better family planning and future healthy lives.[9] Unfortunately, this program is considered ineffective because it has not contributed significantly to the reduction of HIV, sexually transmitted infections (STIs), or unwanted pregnancy. The program is also less focused on smoking, alcohol, and drug abuse. Despite the adolescents are the nation's valuable generation, life skill education is provided sporadically and typically only by Non-governmental organizations (NGOs), and some schools through extra-curricularly.[10]

Adolescent sexual and other problematic behaviors such as smoking, alcohol use, and drug abuse share certain common features. Studies in the United Kingdom (UK) and the United States (US) have found associations between substance use and risky sexual behavior among adolescents.[11] When youths participate in one risky health behavior, they tend to participate in other risky health behavior.[12] Despite the assumption of an association between smoking, alcohol, and risky sexual behavior, there is limited study targeting youth with multiple risk behavior, particularly in Central Java.

This study examined the factors that influence adolescent risk behavior such as smoking, alcohol use, and dating behavior, and analyzed the interrelationships between smoking, alcohol use, and sexual activity among adolescents in Central Java, Indonesia. This study would provide much needed information to improve the understanding of what shaped sexual risk-taking behavior, and particularly what the role of smoking, alcohol use, and drug abuse contributing to risky dating behavior among the youth.

Method

This study employed an explanatory research method with a cross-sectional approach. Sample size was calculated using a formula for single proportion, with the z-value corresponding to the confidence of 95% and the z-score to the power of 80%. The prevalence level for multiple risk behavior was 30% from previous studies,[13] and the expected prevalence level was 40.5%. A total of 160 randomly-selected adolescents aged 15–24 years were involved in this study. The inclusion criteria were willing to participate and to be involved in the next phase of the study. The Sembukan and Sidorejo Villages of the Wonogiri Subdistrict and the Sukorejo and Sidokumpul Villages of the Demak Subdistrict were selected purposively based on having higher incidences of smokers, alcohol users and adolescent with sexual courtship activity, such as kissing and making out. Married youths were excluded, so contraception use was not assessed in this study.

This study used the type of self-administration in which a structured questionnaire was provided to respondents with an enumerator present. The validated questionnaire consisted of sections covering the respondents' personal background (individual and parent characteristics), religiosity, self-esteem, self-efficacy, social activity, knowledge and attitudes multiple risk behaviors (reproductive health, smoking, alcohol use, and drug use), as well as that of respondents' friends, parents, and other key persons. The questionnaire was developed and adopted from a UK adolescent multiple risk behavior survey,[13] Rosenberg's self-esteem scale for cross-sectional direct assessment,[14] and a self-efficacy scale for adolescents.[15,16] The Rosenberg's self-esteem scale consists of ten statements that measure degree of confidence by asking the respondent to record a number between 0 "cannot do at all" and 10 "highly certain I can do.". For example, "I feel that I am a worthy person, at least on an equal basis with others." While, the self-efficacy scale measures degree of confidence of youth in terms of the ability to prevent risky health behaviors by choosing an answer from "Truly unsure" to "Truly sure", for example, "I am able to resist peer pressure to smoke cigarettes."

The respondents signed informed consent forms before completing the self-administered questionnaires. The study protocol was approved by the Diponegoro University Faculty of Public Health related to the Research Ethics Committee Document No. 053/EC/FKM/2018. Univariate analysis was used on the data to determine the frequency of each variable distribution. Statistical tests using chi-square and logistic regression were conducted to examine the factors' influence on multiple adolescent risk behavior.

Results

The youths' average age was 16 years old (SD 1.336); most respondents were over 16 (71.9%), and 28.1%

were under 16. More than half of respondents were male (55%) with high school education level (70%). Most (66.7%) spent their allowance buying food and school supplies (23.3%), while only 16.7% spent it on entertainment items, such as topping up their mobile phones. Most respondents' fathers' had a high school education (46.7%); 20% had a junior high school education, and 28% had only elementary school education. While, the average maternal education was very low: 45% of respondents' mothers only had elementary school education; 26.7% had junior high school education, and 23.3% had high school education. Fathers' occupations were mostly informal jobs (40%); 26.7% were farmers, and 18% were civil servants, with an average monthly income of under IDR 2 million. The mothers were mostly housewives (38.3%) and farmers (26.7%). More than half (55%) of them admitted to being religious people. For adolescent leisure activities, 53% have watched porn videos; 28% have read pornographic comics; 40% have ever courted; and only one person ever visited a prostitute.

In term of sexual behavior, 28% of respondents had dated recently. The average respondent with a boy/girl-friend has dated twice, with the age of first date falling within the range of 14–16 years old, while the youngest to have dated was 10 years old. Dating activities were categorized as low or high risk, in which the low was defined as holding hands and kissing, and high-risk behavior includes necking, petting, and sexual intercourse. One person had sexual intercourse with a prostitute at the age of 15 years. Regarding smoking and alcohol use, 30% of smokers had been smoking for 10

years; on average, they started smoking at age 12. More than 30% of smokers reported being heavy smokers (1 pack/day); 66.7% of them reported being light smokers (<1 pack/day). Only 5% of them have drunk liquor or local alcohol, and only during wedding parties. In the case of drug users, only two people had tried marijuana long before.

More than half of respondents scored high in knowledge on reproductive health, and the effect of smoking and alcohol's on health. Most respondents provided correct answer to items of basic knowledge: in seven out of 10 items of reproductive health knowledge; five out of seven items of smoking effects; five out of six items of alcohol use effects; and four out of five items of drug effects (correct answers were 54.3%, 51.3%, 51.2%, and 67%, respectively). However, many respondents provided incorrect answers to questions about reproductive health knowledge (Table 1). In particular, the majority believed that pregnancy would not occur in only in one instance of intercourse (41.9%); did not know about symptoms of STIs (48.0%); and believed that eating pineapple after sex could prevent pregnancy (21.3%). Additionally, some respondents did not know that cigarettes contain harmful chemicals and cause heart and lung diseases (44%). Half of respondents also misunderstood the effects of alcohol use on physical and psychological health. Nearly all of them were aware of the dangers of drug abuse (Table 1).

In terms of attitudes toward sexual behavior, smoking, alcohol use, and drug use, the majority of respondents indicated permissive attitudes toward sexual behavior (56.2%) and smoking behavior (62.5%), but

Table 1. Frequency Distribution of Youths' Knowledge of Reproductive Health, Smoking, and Alcohol Use

Variable	Category	Number of Subjects with Incorrect Answer (n=160)	%
Reproductive health	Pregnancy will not occur in one-time intercourse	67	41.9
	Signs of puberty in adolescents	58	36.3
	Eating pineapple after sex prevents pregnancy	34	21.3
	Symptoms of sexually transmitted infections (STIs)	76	48.0
Cigarette smoking	Cigarettes contain harmful chemicals	70	44.0
	Smoking causes heart disease, lung cancer	70	44.0
Alcohol use	Effect of alcohol use on physical health	80	50.0
	Effect of alcohol use on psychological health	87	54.4
Drug use	Effect of drug use on health	20	12.5

Table 2. Association between Smoking, Alcohol Use and Dating Behavior among Youths

Category	Variable	Dating Behavior				p-value
		Yes		No		
		Frequency	%	Frequency	%	
Smoking	Yes	21	44.7	26	55.3	0.005
	No	24	22.1	89	77.9	
Alcohol use	Yes	4	50.0	4	50.0	0.270
	No	81	53.3	71	46.7	

only 31.2% of youths admitted to consuming traditional alcohol and only 12.5% admitted to using narcotics. While, friends' attitudes showed similar results in terms of sexual behavior, smoking, drinking, and narcotics use.

Table 2 and Table 3 show a strong association between smoking behavior and dating behavior (p-value = 0.005). The percentage of youth who had dated recently had a higher level of smoking behavior (44.7%) compared to those who did not smoke (22.1%). On the other hand, alcohol use was not significantly associated with risky dating behavior (p-value = 0.270). This is probably because few youths have experience using alcohol. Interestingly, there was a significant association between alcohol use and smoking behavior among youths, with p-value = 0.001. A higher percentage of youths who had smoked also drank alcohol (88.9%) compared to those who don't drink alcohol (25.8%).

Table 4 shows that self-efficacy to prevent risky behavior, smoking behavior, and leisure behavior significantly influenced youth dating behavior (p-value = 0.048, 0.005 and 0.003, respectively). Currently-smoking youth were three times more likely to experience risky dating behavior compared to non-smokers (OR = 3.03). In addition, youth with negative/risky leisure behavior, such as watching pornographic film or comics and visiting prostitute, were more likely to have risky dating behaviors compared to those with positive/non-risky leisure behavior (OR = 3.21). Regarding self-efficacy, youth with high self-efficacy rates of for preventing risky behavior were more protected from risky dating behavior compared to those with low self-efficacy. This means that youth with low self-efficacy were more likely to engage in risky dating behavior.

Table 5 shows the result of multivariate analysis of independent variables to multiple risky behaviors as the dependent variable. Multiple risky behaviors refer to smoking, alcohol use, and risky dating behavior variables. The findings showed that only the self-efficacy variable has a strong influence on multiple risk behaviors (p-value = 0.041; OR = 0.51). This means that youths who have high self-efficacy were more protected from engaging in multiple risk behavior compared to those with low self-efficacy. When risky dating behavior was examined as a dependent variable, three variables influenced risky dating behavior: positive smoking behavior, risky leisure behavior, and low self-efficacy.

Discussion

Adolescence is a time of transition period between childhood and adulthood. This period covers a range of ages from 8–14; at which adolescents are searching for their identities, showing great curiosity, and loving the

Table 3. The Association between Alcohol Use and Smoking Behavior among Youths

| Alcohol Use | Smoking Behavior | | | | p-value |
| | Yes | | No | | |
	Frequency	%	Frequency	%	
Yes	8	88.9	1	11.1	0.001
No	39	25.8	112	74.2	

Table 4. The Result of Multivariate Analysis on Variables of Demographic, Knowledge, Attitude, Friends' and Family Attitude, Self-Efficacy, Self-Esteem, Smoking Behavior, Alcohol Use, and Dating Behavior

| Variable | β | SE | Wald | Sig. | Exp(β) | 95% CI | |
						Lower	Upper
Self-efficacy (high)	-0.750	0.380	3.894	0.048	0.472	0.224	0.995
Smoking behavior (+ smoking)	1.110	0.392	8.026	0.005	3.033	1.408	6.535
Leisure behavior (risky)	1.167	0.397	8.649	0.003	3.212	1.476	6.992

Note: CI= Confidence Interval, β = Beta Coefficient; Sig.= Significance; Exp (β)= Beta Exponential

Table 5. The Results of Multivariate Analysis on Variables of Demographic, Knowledge, Attitude, Friends' and Family Attitude, Self-Efficacy, Self-Esteem, and Composite Risky Behaviors (Risky Dating Behavior, Smoking Behavior, and Alcohol Use

| Variable | β | SE | Wald | Sig. | Exp(β) | 95% CI | |
						Lower	Upper
Self-efficacy (high)	-0.674	0.330	4.169	0.041	0.510	0.267	0.973
Self-esteem (high)	0.524	0.330	2.513	0.113	1.688	0.887	3.225

Note: CI= Confidence Interval, β = Beta Coefficient; Sig.= Significance; Exp (β)= Beta Exponential

challenge of trying new things. Most of the reasons adolescents involve themselves in risky behavior are because of their curiosity; it often occurs without being planned or forced by peers. This reflects an adolescent's lack of understanding about healthy living and the effects of unhealthy behavior, and the lack of ability to face or prevent risky behavior.[8]

This study examined the links between smoking, alcohol use, drug use, and sexual behavior among adolescents in Central Java and studied the factors that influence risky dating and other multiple risk behavior. A strong association was found between smoking and risky dating behavior, and a significant association was found between smoking and alcohol use. These associations were even stronger for adolescents with multiple risky behavior. Risky dating behavior determined and the multiple risky behavior variables were also selected as a dependent variable to examine the factors that influence risky behavior. The results of multivariate analysis show that self-efficacy of preventing risk behavior was a predictor of risky dating behavior as well as of multiple risk behaviors among the youth. Negative/risky leisure behavior and smoking behavior were also identified as predictors of risky dating behavior.

Studies in the United Kingdom show that the youth, particularly young boys, who engage in multiple substance use were more likely to report risky sexual behavior.[11] Although the number of the youth involved in multiple risky behaviors was small in this study, these results aligned with several studies from other countries showed that concurrent multiple risk behavior is associated with low self-efficacy and low self-esteem, as well as a general propensity toward potential risk-taking that is related to the self-regulation capacity influenced by adolescent brain development.[11]

This study showed that 28% of adolescent were currently dating; this aligns with the fact that most respondents were still in high school and were very young (the average age was 16). Among dating adolescent, only 10% admitted to having experienced pre-marital sex. Some youths reported trying to go to prostitutes because of being forced by a friend. Several studies suggested that pre-marital sex behavior is strongly influenced by friends' sexual behavior, religiosity, and attitudes. Adolescents with friends with risky sexual behaviors are eight times more likely to engage in risky sexual behavior compared to those who do not have sexually active friends.[16] In addition, adolescents with more permissive attitudes to sexuality are four times more likely to engage in risky sexual behavior than adolescents who are less permissive.[17]

In terms of smoking behavior, adolescents become familiar with cigarettes at an early age: generally when they are 11–13 years old. World Health Organization (WHO) data confirms that 30% of people in the world are smokers. Therefore, it can be said that smoking behavior begins during childhood and adolescence.[18] This study found that 30% of respondents have smoked, and one-third of smokers were heavy smokers (more than one pack/day). Then, they began smoking since elementary school. There are many reasons behind adolescent's smoking behavior. According to Lewin, smoking behavior is influenced by both social environment and individuals, that is, smoking behavior is not only caused by internal factors, but it is also influenced by external factors, such as parents, family member, other key persons, and the surrounding environment.[19] When adolescents experience a psychosocial crisis during their development, they often begin to experiment with smoking. The crisis can be seen in the way they decide to take the risk of smoking. For adolescents, smoking behavior and alcohol use are symbolic behavior. By smoking and drinking alcohol, adolescents are trying to look mature, strong, and brave, and to appeal to the opposite sex and to their peers.[20]

In understanding youth risk behavior, many studies in Indonesia concerned with sexual risk behavior have focused more on the youths knowledge and attitude related to sexual behavior. Such investigations limit understanding of other important factors that are potentially protective such as self-efficacy, self-esteem, and locus of control.[21] This study showed that variables of demography, knowledge, and attitude did not influence risky dating or multiple risk behaviors. However, the self-efficacy variable has a strong association and influence on risky dating and multiple risk behaviors. The literature suggested that self-efficacy influenced initiating behaviors.[15] Another study has also demonstrated that the youth with high self-efficacy are generally more effective at facing social environmental demands.[20]

Another study found that self-esteem and self-efficacy were related to academic adjustment. Individuals with low self-esteem and low self-efficacy were characterized by a sense of incompetence in social relationships.[21] This means that low self-esteem and low self-efficacy have been linked to numerous youth risk behaviors such as smoking, alcohol use, and sexual behavior. Youth engaging in these risky behavior may experience significant health problems in the future.[12] It is alarming to youth with high self-efficacy while living in the era of increasing lifestyle diseases such as HIV, STIs, heart disease, and cancer. The need to explore how self-efficacy influences multiple risk behaviors is highlighted.

Individual behavior is caused by environmental, personal, and cognitive influences. Multiple risk behavior are not only based on the imitation process and positive

reinforcement from family and peers, but also in consideration of the consequences of the chosen behavior.[15] Individuals will find it easier to adopt good behavior if they are supported by family members, friends, and their general social environment. However, this study emphasizes the idea that self-efficacy and self-esteem are possible mediators enabling adolescents to resist negative peer and social environment influences to engage in risky behavior and make informed choices about living healthy lives.

Conclusion

A strong association was established between smoking and risky dating behavior. Likewise, there is a significant relationship between alcohol use and smoking behavior among youth. Self-efficacy, leisure behavior, and smoking behavior variables are predictors of risky dating behavior, while only self-efficacy is a predictor of multiple risk behavior. This study indicates that youth who never involve with risky behavior have higher self-efficacy. The results highlight the importance of providing youth with the skills they need to feel confident in their ability to avoid health risk behavior like smoking, alcohol use, and sexual behavior.

Only one-third of the youth in this study are currently dating, and 10% of them participate in high-risk dating activities such as necking, petting, and intercourse. Regarding smoking behavior, 30% are smokers, although the majority are light smokers (less than one pack/day). This is probably because they are still in school, with no income, thus they smoke only outside school. Regarding alcohol use, only 5% of respondents have experience with drinking liquor such as beer, wine, and traditional blended alcohol.

In terms of knowledge, nearly half of participants have low levels of knowledge about reproductive health, the effects of cigarette smoking, and alcohol use. Most respondents display permissive attitudes to sexual and smoking behavior, but not toward alcohol or narcotic use. Friends' permissive attitude toward smoking and sexual behavior are also associated with participant's attitudes. This study recommends that youth's life skills are needed to improve self-efficacy and prevent risky behavior as well as to improve knowledge and attitudes by developing interventions aligned with the youth's personal characters, cognitive factors, and socio-cultural environment, particularly before they begin to participate in risky behavior. Further explorative study is needed to study the influence of social-cultural settings, socio-economic factors, and psychological vulnerability, as well as cognitive factors, including self-efficacy with regard risky behavior, to further policies and interventions.

References

1. World Health Organization. Scaling up adolescent health in South-East Asia report of regional programme managers' meeting. Bangkok; 2011.
2. Statistics Indonesia, National Population and Family Planning Board, Ministry of Health, ICF International. Indonesia demographic and health survey 2012. Jakarta; 2013.
3. Nwagu EN. Alcohol and drug usage; and adolescents' sexual behaviour in Nigeria. Health Promotion International. 2015; 31: 405–13.
4. Kementerian Kesehatan RI. Hasil utama Riskesdas 2018. Jakarta; 2018.
5. Jacob P, Benowitz NL, Destaillats H, Gundel L, Hang B, Green MM, et al. Thirdhand smoke: New evidence, challenges, and future direc-

tions. 2017; 30(1): 270–94.

6. El Hasna FNA, Cahyo K, Widagdo L. Faktor-faktor yang berhubungan dengan penggunaan rokok elektrik pada perokok pemula di SMA kota Bekasi. Jurnal Kesehatan Masyarakat. 2017; 5(3): 2356–3346.

7. Mardalina A. Faktor–faktor yang berhubungan dengan perilaku seks berisiko HIV/AIDS pada Tenaga Kerja Bongkar Muat (TKBM) di pelabuhan Tanjung Emas Semarang. Jurnal Kesehatan Masyarakat. 2017; 3(3): 869–76.

8. Kementerian Kesehatan RI. Buku petunjuk penggunaan media KIE versi pelajar tentang aku bangga aku tahu. Jakarta; 2012.

9. Susanti HA. Strategi komunikasi Badan Kependudukan dan Keluaga Berencana Nasional (BKKBN). Jurnal Asosiasi Pendidikan Tinggi Ilmu Komunikasi. 2015; 2(4): 243–54.

10. Sekarpuri AD. Inklusi saluran informasi kesehatan reproduksi remaja. Jurnal Studi Pemuda. 2014; 3(2): 133–9.

11. Khadr SN, Jones KG, Mann S, Hale DR, Johnson AM, Viner RM, et al. Investigating the relationship between substance use and sexual behaviour in young people in Britain: findings from a national probability survey. BMJ Open. 2016; 6(6): 1–11.

12. Sychareun V, Thomsen S, Faxelid E. Concurrent multiple health risk behaviors among adolescents in Luangnamtha province, Lao PDR. BMC Public Health. 2011; 11(1): 36.

13. Kipping RR, Smith M, Heron J, Hickman M, Campbell R. Multiple risk behavior in adolescence and socio-economic status: Findings from a UK birth cohort. European Journal of Public Health. 2015; 25(1):

44–9.

14. Altmann T, Roth M. The self-esteem stability scale (SESS) for cross-sectional direct assessment of self-esteem stability. Frontiers in Psychology. 2018; 9: 1–9.

15. Tsang SKM, Hui EKP, Law BCM. Self-efficacy as a positive youth development construct : a conceptual review. The Scientific World Journal; 2012.

16. Gloppen KM, H MP, David-ferdon C, Ph D, Bates J, H MP. Confidence as a predictor of sexual and reproductive health outcomes for youth. Journal of Adolescent Health. 2010; 46(3): 42–58.

17. Azinar M. Perilaku seksual pranikah berisiko terhadap kehamilan tidak dinginkan. Jurnal Kesehatan Masyarakat. 2013; 8(2): 153–60.

18. Shaluhiyah Z, Suryoputro A, Setyawati A. The needs of information services on reproductive health, STIs in HIV in middle adolescence. KEMAS: Jurnal Kesehatan Masyarakat. 2017; 12(2).

19. Moghaddam HT, Bahreini A, Abbasi MA. Adolescence health : the needs, problems and attention. International Journal of Pediatri. 2016; 4(26): 1423–38.

20. Perez A de M, Benseñor IM. Tobacco and alcohol use, sexual behavior and common mental disorders among military students at the police academy, São Paulo, Brazil. A cross-sectional study. Sao Paulo Medical Journal. 2015; 133(3): 235–44.

21. Fauzi R, Areesantichai C. Factors associated with cigarettes use among high school students in Jakarta. Kes Mas: Jurnal Kesehatan Masyarakat Universitas Ahmad Daulan. 2016; 10(2): 131–8.

Evaluation of Program for Overcoming Intestinal Worm Infections among Children

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Abstract

Prevalence of intestinal worm infection in general is extremely high in Indonesia among the poor population with poor sanitation. One of the government programs to address this problem is the distribution of medicines to prevent intestinal worm infections. However, the coverage of the achievement for this program is still low in several areas of public health centers in Palembang. Therefore, this study was conducted to evaluate the efficacy of the national program for preventing intestinal worm infections. The qualitative research design used evaluation model approach Context, Input, Process, and Product (CIPP) model. This study was conducted in one of health centers in Palembang City. The informants were selected using purposive method. Data collection was done via in-depth interviews, document reviews, and observations. Descriptive content analysis was used to examine and process the collected data. Results showed that, from situational factor, the program is held by the government because of the high prevalence of intestinal worm infection. The study found the input component, limited staff that handles this program. There were limited facilities for the extension of the infrastructure. In the process component, the distribution of the drug albendazole was not optimal in all elementary schools. Four elementary schools did not receive albendazole. This study demonstrated that the implementation of the program was not optimal.

Keywords: drug distribution, evaluation, worm infection

Introduction

Soil-transmitted helminth infections are among the most common diseases worldwide and affect the poorest and the most deprived communities. These infections spread through the eggs present in human feces in areas with poor sanitation.[1] Soil-transmitted helminth infections of humans are included within the World Health Organization (WHO) classification and termed as neglected tropical diseases. The maximum proportion of these infections has been reported among the population of Southeast Asia.[2]

More than two billion people are infected with worms throughout the world, and 300 million people suffer from helminth infection (helminthiasis), which leads to the death of 150,000 people due to infections with soil-transmitted helminth infections.[3] The global prevalence of anemia in school-age children shows a high rate of approximately 37%, whereas it is 13.4% in Thailand and 85.5% in India; the prevalence of anemia among children in Asia reaches around 58.4%.[4]

A test for helminthiasis is considered to be positive when worm eggs or at least one type of worm is observed in the specimen. Soil-transmitted helminth worm infections are widely found in primary school-age children.[5] A recent study reported that more than 267 million preschool-age children and more than 568 million school-age children live in areas where these parasites are intensively transmitted and require treatment and preventive interventions.[6] School-age children also have the highest class infected with worms that spread through the soil. There are several cases of intestinal worms from *Ascariasis* worms. Soil-transmitted helminth infections can occur through the ingestion of worm eggs from the ground or ingestion of active larvae in the soil through the skin.[7]

Worm infection is an endemic disease caused by parasites that not only can be deadly, but also undermine the health of the human body, which can thereby reduce the nutritional status and health of the population.[8] Factors that are responsible for the high rates of helminthiasis include inadequate environmental sanitation conditions, poor personal hygiene, education level,

low economic conditions, knowledge of attitudes and behavior toward uncultured healthy living, and geographical conditions suitable for worm breeding.[9] Worm infections are one of the neglected diseases, so that there is less attention toward both prevention and treatment.[8]

Intestinal worm infections still represent a widespread public health problem in most parts of Indonesia, which can in turn reduce the nutritional status, intelligence, and productivity of the population. Efforts made to reduce intestinal worm infections are primarily focused on children aged < 5 years. Schools must be empowered with community programs and cross commitments sector. The government made the Regulation of Health Minister No. 15/2017 to eradicate helminthiasis.[9] Evaluation aims not to prove the fault of a program, but to improve the program and the importance of this program as a decrease in the number of helminthiasis in children that has an impact on reducing health conditions and reducing intelligence in children. It is necessary to conduct an evaluation of the implementation of worm mass prevention drug delivery programs in children school.[10] The aim of this study was to evaluate the program for reducing the burden of intestinal worm infections using evaluation model approach CIPP (context, input, process, and product) model.

Method

This study used a qualitative study design using the context, input, process, and product (CIPP) model evaluation approach.[10] The model was used to evaluate the program. It was evaluated based on Regulation of Health Minister No. 15/2017 for reducing the burden of intestinal worm infections. In this context, the study evaluated the background of the program and its goals and objectives. In the input component, the study evaluated the human resources, infrastructure, budget funds, and management information system. In the process component, the study evaluated the planning, implementation, monitoring, and evaluation of the program. In the product component, the coverage of achievement of the program was evaluated.

This investigation was a descriptive study, aimed at obtaining in-depth information to determine the problems clearly and understand the meaning behind the data or information derived, which in this case was regarding the evaluation of worm disease prevention programs.[11]

The study informants consisted of one head of the *Pemberantasan Penyakit Menular* / P2M (Eradication of Infectious Disease) City Health Office, one head of the Primary Health Care, one holder of the program for the administration of helminthiasis, and one pharmacist. The supporting informants were derived from elementary school-age children who were selected, considering that the informants had the required information and were involved in the implementation of worm mass prevention medicines. This study was conducted at one primary health care in Palembang City from May to June 2018.

Data collection was done through in-depth interviews with some informants regarding the implementation of the program, observation of the facilities and the process of the program, and reviewing the guidelines and documents tailored to the type of data. A document study was conducted to check the completeness of data related to the schedule of administering the worm mass prevention medicines and program achievement data. In-depth interviews were conducted with key expert informants (Head of the *P2M* division, head of the primary health care, and worm program holder and primary health care pharmacy officer) and supporting informants (some children from elementary schools), observing the facilities of the program.

The study observed the availability of albendazole or deworming medicines and also the promotional facilities such as leaflets, counseling booklets, and posters. Supporting data were obtained from document studies or archives related to the implementation of helminthiasis prevention programs among schoolchildren. Then the study created a table to input the information and perform a checklist with sign (+) that indicates available and (−) indicating unavailable.

The supporting informant was used for triangulation data analysis. The study obtained some information about the implementation this program in elementary schools. The information was on the distribution of the medicine albendazole in schools. Data processing was conducted using content analysis.[12]

Data validity was evaluated using data triangulation. Triangulation is a technique of checking the validity of data that uses something else outside the data to check data or as a comparison to the data.[13] The triangulations conducted in this study were source triangulation, method triangulation, and theory triangulation.

Data analysis was conducted after all the data were collected and processed. The contents of the data were analyzed. Qualitative data analysis was related to data reduction, data categorization, synthesis, and working hypothesis.[13] The results of this study in the form of data processing are presented in the form of matrices and narratives. For the results of the study to be detailed, objective, and neutral, quotations from the informant's statement in the original form to describe the results of the study were added. This study was equipped with interview matrices, which were arranged and grouped based on questions and variables to facilitate understanding and conclusion. Before conducting this study, ethical

approval was obtained from the ethical institution at the Faculty of Public Health, Sriwijaya University, with the Number 106/UN9.1.10/KKE/2018.

Results

The implementation of administering worm mass prevention medications is represented in the form of an explanation description using the CIPP evaluation model, which includes context, input, process, and product (Table 1).

Findings in the field of the context component included the background of the program and its goals and objectives. The goal of establishing this helminthiasis program was to reduce the number of helminthiasis cases among schoolchildren. The environmental conditions of each primary school were undoubtedly different, that was, if viewed from a distance, there were elementary schools that near people's homes, but there were also elementary schools in remote areas or away from the crowd, so that it takes approximately 15 minutes to reach the school. There were also still several elementary schools whose environment was inappropriate due to swamp conditions, presence of excess garbage and unpleasant smell, and lack of hygienic sanitation, which are included in the category of slums, clean and healthy

lifestyle in the school environment have not been applied

"So, the policies and concern underlining why this program of helminthiasis prevention medicines is essential to give is that because the prevalence of helminthiasis in school-aged children is quite high at around 30% [...] because this is a disease related to environment, water, with PHBS (clean and healthy lifestyle), with handwashing, of course this will be a very high case of intestinal worms in areas with poor hygiene sanitation. The poor hygiene sanitation is like the slum, the dense, areas where water distribution is not feasible." (IK 1)

Based on the document review conducted on the Ministerial Regulation on the provision of helminthiasis prevention drugs included in the policy of situational factors, according to Regulation of the Minister of Health No. 15 of 2017 concerning worm prevention that the prevalence of intestinal worms at 20% - 50% must administer worm mass prevention medicines once a year.

Each program certainly has an objective/target. The target of this worm disease prevention program is all children aged 6 – 12 years, and the role of the cross-sector is very much required for administering helminthiasis medicines to achieve the goals of the program.

"The goal was, school-age children (6–12 years) conclusions for all children aged 6 to 12 years." (IK 1)

If viewed from the above-described background, the

Table 1. Results of Observation on Mass Drug Administration for the Prevention of Helminthiasis

Component	Primary Health Care
Context	
There is a policy on administering mass worm disease prevention drugs	+
There is the purpose of providing mass worm disease prevention drugs	+
There is a target of providing mass worm disease prevention drugs	+
There is environment support of administering mass worm disease prevention drugs	+
Input	
Specifications of education with occupation in the implementation of worm disease prevention programs	+
The number of human resources with standards in the implementation of worm disease prevention programs	-
The existence of training in the effort to provide worm disease prevention drugs	+
The utilization of health operational assistance funds for the implementation of activities for administering worm disease prevention drugs	+
Adequate allocation of funds to carry out the program	+
There is evidence of accountability for the use of funds in the implementation of the program	-
Guidebook for administering mass prevention drugs for health workers	+
The existence of promotional media such as posters, leaflets, and brochures	-
The presence of a management information system in the program of administering worm disease prevention drugs	+
Is the benefit of information systems running well	+
Process	
Having data on the amount of worm disease participants in each elementary school according to gender and age	-
Having data on the number of elementary schools	+
Preparing the team as the person in charge and implementing the program of administering mass worm disease prevention drugs	+
Cross-sector-related socialization to obtain support and initial efforts to form partnerships	+
Schedule of activities	+
Letter of assignment in the implementation of the worm disease prevention program	-
The recapitulation of the activity implementation report	+
Documentation of the implementation of activities	-
Monitoring various internal factors (e.g., officers, planning, infrastructure) to carry out the activities of administering mass worm disease prevention drugs	+
Monitoring the progress of the implementation of the activities of providing mass worm disease prevention drugs	+
Product	
Data on target programs for administering mass worm disease prevention drugs	+
Achievement data of administering mass worm disease prevention drugs	+
Data on the socialization of worm disease mass prevention drugs program	+

Note: + (available), – (unavailable)

aim of this worm disease prevention program is to reduce the number of worms in children.

> "*The goal is clear with the provision of this worm mass prevention drug in the hope that it will reduce the rate of helminthiasis in children aged 6 to 12 years and prevent stunting.*" *(IK 2)*

Based on the observation results, theaim of this program refers to Regulation of Health Ministry No. 15 of 2017 regarding Worm Tackling. The program has general and specific goals. The general goal is to reduce the prevalence of intestinal worms in elementary school-age children. The first specific objective is to reduce the prevalence of intestinal worms in primary schoolchildren by 10% in stages, and the second objective is to increase the achievement of coverage of the provision of deworming mass prevention medicines by at least 75%. Therefore, it can be concluded that the precise aim of this program is to reduce the number or the prevalence of helminthiasis cases among children aged 6 – 12 years (Table 2).

Field findings on the input component are human resources, infrastructure, budget funds, and management information systems. Resources are precious assets to achieve a goal. Quantitatively, there were one officer and manager of the Mass Drug Administration for the Prevention of Helminthiasis, as well as the officer providing the Mass Treatment of Helminthiasis.

> "*... there was one program manager at the primary health care, one PNS (civil servant), and the officer of Helminthiasis Prevention Program for mass prevention...*" *(IK 3)*

For human resources in the program for administering the helminthiasis mass prevention medicines, there was no standard for the quantity or number of program management officers.

> "*The program officer is one person [...] that officer [...]*" *(IK 4)*

The facilities and the infrastructure contained in this program are not extensive according to the statement of the informants of the facilities and the support provided in the program for administering these worm mass prevention drugs.

> "*... especially medicines, your albendazole, then supported by facilities and infrastructure, such as for promotion, promoting programs for administering helminthiasis mass prevention medicines, such as leaflets, booklets, and posters.*" *(IK 1)*

According to the results of observation through the observation sheet, the study found only albendazole or deworming medicines, and other promotional infrastructure facilities, such as leaflets, booklets, and posters were not found as they were unavailable in this program. Another promotional infrastructure was only through counseling. Thus, the facilities and the support in this program are still inadequate or not optimal as there are still limited facilities for the extension of the infrastructure.

Funds are limited resources required to support the implementation of a program. The sources of funds for Mass Drug Administration for the Prevention of Helminthiasis programs came from State Budget and Revenue, Regional Budget, and other legitimate funding sources; however, in this program, there are no funds in the primary health care because it receives only helminthiasis medicine and the primary health care will later take it to the pharmacy warehouse, but for the primary health care, it is necessary to take funds.

> "*The source of funds for the worm prevention Bulk Drug Provision program comes from the State Budget and Revenue, Regional Budget, and other legitimate funding sources. If our personnel takes it from the health operational assistance funds [...] if the helminthiasis medicine comes from the office, it might be from the (Health) Ministry [...] it is from the office […] because the helminthiasis medicine is already programmed.*" *(IK 2)*

The funding for this program was derived from the National Budget, the Regional Budget, and other legitimate funding sources for the 2017 Mass Drug Administration for the Prevention of Helminthiasis delivery program in the form of meetings, training,

Table 2. Summary of Qualitative Study Results on the Context Component in Administering Mass Worm Disease Prevention Medicines

Variable	Study Result
Background	Ministry of Health Regulation, Republic of Indonesia, Number 15 of 2017 regarding worm prevention
Target	The target of this program is all children aged 6–12 years
Purpose	To reduce the prevalence or rate of worms in children aged 6–12 years

Table 3. Summary of Qualitative Study Results on the Input Component in Administering Mass Worm Disease Prevention Medicines

Variable	Result
Human resources	The number of human resources in administering mass worm disease prevention medicines for one program holder and con currently serves as an officer. Diploma III in Midwifery educational background
Facility and infrastructure	The availability of albendazole The limitations of extension of infrastructure facilities such as leaflet, booklet, and poster, as they do not yet exist
Budget source	The funds for administering mass worm disease prevention medicines were derived from the National Budget, the Regional Budget, and other legitimate sources. Transport funds for program officers following the policies of primary health care
Management infomation system	There are differences in results, and the information obtained is less accurate

implementation, monitoring, and evaluation of worm disease prevention programs. The management information system is an application program created to help primary health care to manage quickly and easily. An optimal implementation of information systems has the potential to reduce workload and increase time efficiency (Table 3).

"Yes, every report from each primary health care is inputted. If it does not use the information system in other forms of data, (the report) can be lost [...] in the department, (there are) also many programs, not only program for helminthiasis." (IK 1)

Variables in the process component are preparation, implementation, monitoring, and coaching of the program. Preparation of albendazole medicine distribution that albendazole medicine in the Provincial Health Office or the City Health Office enter the pharmaceutical warehouse, each primary health care officer takes the albendazole medicine directly to the pharmaceutical warehouse in accordance with the targets previously reported.

"Our preparation is only once every six months; the most widely prepared is to receive the helminthiasis medicine from the target and the target." (IK 2)

The component of the implementation process of the worm intestinal mass prevention medicines delivery program is the first to distribute existing medicines, before distributing the medicines, of course, socialization. Officers from the primary health care immediately visited each target in the work area of each primary health care to distribute albendazole or the deworming medicine according to the target amount. Officers or program holders go to primary schools that are the target of the program; there are elementary schools that are receive albendazole from health workers, and there were also elementary schools that receive albendazole from teachers at primary schools.

"For the implementation carried out by us at this primary health care we immediately go to elementary school to give albendazole medication, all children aged 6 to 12 years must get this albendazole medicines." (IK 2)

Monitoring and coaching are vital functions in the implementation of a program to identify the problems and the efforts that will be implemented subsequently.

"Supervision on us comes. There is a monthly Minlog meeting (mini workshop), so (in) each our meeting, (we) talk about the programs of each of us shown, so they know." (IK 1 & 2)

Monitoring and coaching were conducted by the Palembang City Health Office, namely supervision, directly at the primary health care which has the results not yet according to the target set. In Padang Selasa Primary Health Care in Palembang, monitoring and coaching are conducted in the form of a monthly *Minlog* meeting to discuss each work program. The results of the interview regarding the constraints or obstacles that exist

in the Padang Selasa Primary Health Care in this program showed that there were no obstacles or constraints in the program of administering helminthiasis medicines.

The results of the coverage that existed in the program of providing helminthiasis prevention medicines, which was the target of the achievement and to improve the next program hence existing programs can run better.

"(It is) already achieved, following the target of 100%." (IK 2)

Based on the results of interviews, there was 100% achievement of the helminthiasis mass prevention program. However, a difference was observed after a cross-check on schoolchildren to assess whether the results of the worm prevention program were consistent with the 100% achievement.

According to 16 informants, the study took from each primary school as representatives. There were still four elementary schools that did not receive albendazole or the worm medicines. This implies that the distribution of albendazole has not reached 100%, or it could be said that it did not meet the standard targets that had been set.

Discussion

Management planning functions for an action or a program must include information about what, why, when, where, who, and how the program is going to be implemented.[13] The policy environment is a component that can support a condition or an outcome of a policy, a situation associated with a problem that leads to the formation of the policy. There are four factors that influence a system, namely situational factors, structural factors, cultural factors, and environmental factors. Based on this theory, the study program of mass helminthiasis prevention medicines administration was included in the policy of situational factors. This is in accordance with the Regulation of the Ministry of Health No. 15 of 2017 pertaining to Worm Control, mentioning that the prevalence of intestinal worms is 20%–50%, which is an alert to administer worm mass prevention medicines once in a year. Personal hygiene includes the cleanliness of the skin, head and hair, eyes, nose, ears, nails, and toenails and the hygiene of all parts of the body.[14] The importance of personal hygiene has been emphasized by the Law Number 23 of 1992 Article 3 concerning health, stating that, "Everyone must participate in improving and maintaining the health status of individuals, their families and the environment.".[15]

Each health program has a target group, namely to whom the health program is shown.[16] The target is a particular community group that will be investigated by the planned program.[17] A program is said to be useful when the objective has been achieved.[18] If compared with the Deworming Drug Prevention Distribution

Program for School-Age Children, this program is said to be effective because the objective in this program is clear, that is, all children aged 6–12 years or elementary schoolchildren in grades 1–6 targeted.

Determining the goal is a function to measure the success of a program's activities.[19] The overall objectives can be divided into broad goals and specific objectives. The goal, in general, must have a clear relationship with the mission of the organization, namely the problems to overcome and the description of the conditions to achieve.[20] The aim of this Mass Drug Administration for the Prevention of Helminthiasis is relevant to the background of the establishment of mass deworming prevention medicines.

The division of labor implies the process of division of work tasks from the whole to be more specific or simple and detailed. The entire work is divided based on specific criteria and is more accurate.[21] Compared to the provision of mass helminthiasis prevention medicines, the division of labor was implemented based on the educational background and the ability of the staff at the primary health care. However, there were no more specific criteria. The role of stakeholders is required in running a deworming control program because, while carrying out this program with sufficient budget, adequate facilities and trained human resources are required. Therefore, the target of program implementation can be achieved according to the target set.[8]

The availability of facilities, infrastructure facilities, tools, and materials had already supported the mass helminthiasis prevention medicines distribution program to the level of health centers. The existence of distributed leaflets was an effort to support the program, but no counseling efforts were made either directly or through printed and electronic mass media. Counseling is an effort to empower individuals, groups, and communities to maintain, improve, and protect public health. Based on the results of observations and interviews, the facilities and infrastructure contained in this program were not optimal. Some facilities and infrastructure provided only albendazole, and other infrastructure facilities were unavailable. Only counseling was implemented before the program.[8]

Costs involved in a plan vary extremely depending on the type and number of activities carried out. Inclusion of costs should be completed with details, such as personnel costs, operational costs, costs of facilities and infrastructure or facilities, assessment costs, and development costs.[20]

Funding sources for the Mass Drug Administration for the Prevention of Helminthiasis were from State Budget and Revenue, Regional Budget, and other legitimate sources of funds used for the 2017 program in the forms of meeting, training, implementation,

monitoring and program evaluation. For information in details, the study had not yet received information on allocation fund because informants on this study did not deliver further information; while, the primary health care did not receive funds for this program because the primary health care only received helminthiasis medicine or albendazole in accordance with the target. However, for the primary health care officers, they need to manage transport funds in appropriate with each primary health care.

Enhancement of technological information could increase access in making the work load easier. Primary Health Care Management Information System usage provides convenience and produces accurate information; data search becomes more rapid, and the manufacturer can provide faster reports with uniformity.[22] Quality system information should meet some terms, including the completeness, accuracy, time precision, relevance of the report, and reliability for use every time with data that are always updated.[23] Based on observation, the primary health care has already implemented management information system for the program. It helps ease the reporting and the evaluation of monthly mini workshop.

A worm eradication program consists of health promotion, worm surveillance, control of risk factors, managing the sufferers, and providing bulk medicines for worm prevention. Based on book guidelines for the eradication of worms, the program describes that, before the implementation of administering medicines for preventing worm infections, it is first necessary to implement activities such as counseling corresponding with book guidelines, although the activities not obtained document on during activities.[24] This study is in line with Mass Drug Administration for the Prevention of Helminthiasis research program at which counseling is needed before the implementation of the program, thus the program can be more effective and in line with the plan.

Evaluation was carried out in stages to monitor which stages were running smoothly and which steps were experiencing obstacles in the implementation, so that the development carried out in the framework of achieving the goals has been formulated.[25] Compared with the theory, the implementation of evaluation activities for worm mass prevention programs was specifically not done at stages, but overall, making it challenging to monitor constraints in the implementation of this program. The regulation of the Ministry of Health of the Republic of Indonesia Number 15 of 2017 states that one of the medicines used for deworming is albendazole.

Obstacles or constraints that exist in the program of administering worm mass prevention medicines include late acceptance from schools and administration of

worms or albendazole. This is a constraint for this program. Another obstacle is that this program is still new, thus it takes time to improve and socialize.

The major obstacles that often arise in the implementation of government programs or policies are fostering vertical cooperation, developing horizontal working relationships, and overcoming the problem of rejection of changes that arise from the community.[26] The values strong of local culture and weak relationships and social support can cause ineffectiveness in a program.[27]

The management system is linkages between context, input, process, and output. In one perspective, it is known that one variable to another is related, hence, it can affect a program become not in accordance with the target. The results of interview with other informants obtained that there were still many informants that had not known yet about the helminthiasis program and there were school children that had not yet received a helminthiasis medicine or albendazole. Therefore, it could be concluded that the result of coverage of Mass Drug Administration for the Prevention of Helminthiasis was not yet in accordance with the determined standard target.

Conclusion

The study evaluates the program implemented for reducing the burden of intestinal worm infections. The study finds that, in the input component, there is limited staff who handle this program. There are limited facilities for the extension of the infrastructure. In the process component, the distribution of albendazole was not optimal at all elementary schools. There are four elementary schools that have not received albendazole. In addition, the program coverage achievement is lower than the standard. It is suggested that the government should improve the supervision of the distribution of albendazole at every elementary school.

Abbreviations

CIPP: Context, Input, Process, and Product; WHO: World Health Organization; *P2M: Pemberantasan Penyakit Menular; PHBS: Perilaku hidup bersih dan sehat*

Ethics Approval and Consent to Participate

Ethical approval was obtained from the ethical institution at the Faculty of Public Health, Sriwijaya University, with the Number 106/UN9.1.10/KKE/2018.

Competing Interest

Author declares that there are no significant competing financial, professional, or personal interests that might have affected the performance or presentation of the work described in this manuscript.

Availability of Data and Materials

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Authors' Contribution

Henny Febriyanti: project administrator, study designer, data curator, analysis, and original draft; Haerawati Idris: study designer, data curator and analysis, supervision, writing – original draft, writing – review and editing. All authors have read and approved the final manuscript.

References

1. World Health Organizations. Intestinal worm; 2019.
2. Dunn JC, Turner HC, Tun A, Anderson RM. Epidemiological surveys of, and research on, soil-transmitted helminths in Southeast Asia: a systematic review. Parasite Vectors. 2016; 9(1): 31.
3. Noviastuti AR. Infeksi soil transmitted helminths. Jurnal Majority. 2015; 4(8): 107-16.
4. Sirajuddin S, Masni M. Kejadian anemia pada siswa sekolah dasar. Kesmas: National Public Health Journal. 2015; 9(3): 264-9.
5. Kartini S. Kejadian kecacingan pada siswa Sekolah Dasar Negeri Kecamatan Rumbai Pesisir Pekanbaru. Jurnal Kesehatan Komunitas. 2016; 3(2): 53-8.
6. World Health Organizations. Soil transmitted helminth infection. [serial on the Internet]. 2019 [cited 2018 Jun 1].
7. Hanif DI, Yunus M, Gayatri RW. Gambaran pengetahuan penyakit cacingan (helminthiasis) pada wali murid SDN 1, 2, 3, dan 4 Mulyoagung, Kecamatan Dau, Kabupaten Malang, Jawa Timur. Preventia. 2017; 2(2).
8. Juhairiyah J, Annida A. The policy of helminthiasis control and public knowledge againts helminthiasis in banjar regency South Kalimantan Province. Buletin Penelitian Sistem Kesehatan. 2014; 17(2).
9. Marlina L, Widjaja J. Hubungan pendidikan formal, pengetahuan ibu dan sosial ekonomi terhadap infeksi soil transmitted helminths pada anak sekolah dasar di Kecamatan Seluma Timur Kabupaten Seluma Bengkulu. Indonesian Journal of Health Ecology. 2012; 11(1).
10. Kementerian Kesehatan RI 2017. Peraturan Menteri Kesehatan Republik Indonesia no. 15 tahun 2017 tentang penanggulangan kecacingan. Jakarta; 2017.
11. Widoyoko EP. Evaluasi program pembelajaran. Yogyakarta: Pustaka Pelajar; 2009.
12. Nugrahani F, Hum M. Metode penelitian kualitatif. Solo: Cakra Books; 2014.
13. Syafrudin SK. Organisasi dan manajemen pelayanan kesehatan dalam kebidanan. Jakarta: Trans Info Media; 2009.
14. Tarwoto, Wartonah. Kebutuhan dasar manusia dan proses keperawatan. Jakarta: Salemba Medika; 2010.
15. Moleong LJ. Metodologi penelitian kualitatif. Bandung: Remaja Rosdakarya; 2010.
16. Maulana HD. Promosi kesehatan. Jakarta: EGC; 2009.
17. Azrul A. Pengantar administrasi kesehatan. Jakarta: Binarupa Aksara;

2010.

18. Ryadi AL. Ilmu kesehatan masyarakat. Yogyakarta: Penerbit Andi; 2016.

19. Yandana NA. Efektivitas kerja sama koperasi syariah beriman dengan yayasan yatim mandiri dalam program bunda yatim sejahtera. Doctoral Dissertation. Surabaya: UIN Sunan Ampel Surabaya; 2014.

20. Saleha MF, Satrianegara M. Buku ajar organisasi dan manajemen pelayanan kesehatan serta kebidanan. Jakarta: Salemba Medika; 2009.

21. Fajar NA. Modul Mata kuliah perencanaan dan evaluasi PKM. Fakultas Kesehatan Masyarakat. Indralaya: Universitas Sriwijaya; 2010.

22. Wijayanto D. Pengantar manajemen. Jakarta: Gramedia Pustaka Utama; 2013.

23. Wibisono S, Munawaroh S. Sistem informasi manajemen puskesmas (Simpuskesmas) berbasis cloud computing. Dinamik. 2012; 17(2).

24. Isma SL, Sudaryanto S, Halleyantoro R. Evaluasi program pemberantasan kecacingan pada siswa Sekolah Dasar di Puskesmas Rowosari Kecamatan Tembalang Semarang. Jurnal Kedokteran Diponegoro. 2019; 7(2): 551-61.

25. Mustari M, Rahman MT. Manajemen pendidikan. Jakarta: Raja Grafika Persada; 2014.

26. Mubarak A. Model impelementasi program dalam upaya pencapaian sasaran MDGS 2015 (strategi bagi birokrasi sebagai ujung tombak implementasi 8 sasaran MDGS). 2012 [cited 2018 Jun 1].

27. Imron A. Implementasi kebijakan kesehatan "LIBAS 2+" sebagai upaya menurunkan angka kematian ibu dan bayi di Kabupaten Sampang. Jurnal Kebijakan Kesehatan Indonesia. 2013; 2(3): 107-111.

28. Departemen Kesehatan Republik Indonesia. Sistem Kesehatan Nasional. Peraturan Presiden Republik Indonesia Nomor 72; 2009.

Entomological Index and Home Environment Contribution to Dengue Hemorrhagic Fever in Mataram City, Indonesia

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Abstract

Indonesia is a member of Southeast Asia Regional Office (SEARO) ranked the first in dengue hemorrhagic fever (DHF) problem based on incidence rate (IR) and case fatality rate (CFR). Several provinces in Indonesia experience an outbreak, one of which is the Mataram City in West Nusa Tenggara Province. Mataram City is an endemic area of DHF because the DHF cases are always found in three consecutive years with the number of cases that fluctuate and tend to increase. This study aimed to obtain factors that could be used to improve early warning systems in controlling DHF. This study used a case control design with a ratio of 1:1 to 180 households. The results showed that home environmental factors, such as no ceiling, indoor and outdoor temperature that had the potential for breeding places for mosquitoes, no wire net in ventilation, low lighting and high humidity, related to DHF transmission. Vector distibution with entomology index showed that the existence of larvae, eggs and mosquitoes played a role in dengue transmission. The dominant factors affecting the transmission of dengue in Mataram City are the condition of the ceiling and the existence of mosquito eggs in the house.

Keywords: dengue hemorrhagic fever, entomolgy index, home enviroment, Mataram

Introduction

Dengue hemorrhagic fever (DHF) has spread throughout the world including in the WHO region namely Pan American Health Organization (PAHO), Southeast Asia Regional Office (SEARO) and the Western Pacific Region (WPRO).[1] Indonesia is a member of SEARO, which during 1990-2015 was ranked the first in DHF problems based on incidence rate (IR) and case fatality rate (CFR).[2] In Indonesia, the incidence rate of 2016 DHF increased by 77.96/100,000 population compared to the previous year, e.g., 50.83/100,000 population was still very far from the national target < 49/100,000 population and several provinces in Indonesia experienced an outbreak.[3] The Mataram City is an endemic area of dengue with the fluctuating number of the case because even though the incidence rate in Mataram is lower than the national target, the area has experienced an increase by up to 95.88% in the last two years, from IR 10.68/100,000 in 2015 with CFR 0%, to IR 20.92/100,000 residents with CFR 0.75% in 2016.[4]

Transmission of DHF occurs due to the presence of sufferers and carriers of the dengue virus. The current expansion of dengue shows multifactorial and may include virus evolution, climate change, and social factors such as urbanization, population growth and development, socio-economic, as well as global travel[5] and population mobility caused a significant increase in dengue cases.[6] Other influential factors are climate change, environmental changes and transmission of DHF cases that indicate spatial and temporal patterns.[7] Prospective cohort studies show a correlation between the density of *Aedes aegypti (Ae. aegypti)* and the prevalence of dengue fever infection because vector density is associated with the tendency of mosquitoes to suck blood from humans. This condition increases contact between humans and mosquitoes, or the transmission of dengue virus is very easy; thus, the density of these vectors needs to be reduced as low as possible.[8] The results of the study in Banjarnegara District showed transovarial transmission with a frequency of 11.54% and larva free amount still below 95%.[9]

Several studies showed that mosquito species that have habitat around the human environment with inadequate living conditions and sanitation are *Ae.*

aegypti, *Ae. albopictus* and *Culex quinguefasciatus*.[10,11] Physical environmental factors are factors affecting the presence and level of *Aedes* larvae density such as light intensity, ventilation, drainage, and distance of buildings,[12] but different results are expressed in studies in Yogyakarta and Mataram that humidity is the dominant factor associated with dengue transmission in children.[13,14] A study in Kupang City explained that water use, wall construction, ventilation area and availability of clean water facilities were factors related to dengue cases.[15] Water stored in containers for long periods, long rainfall during the rainy season, humidity and ambient temperature can increase the breeding of *Ae. aegypti* mosquitoes.[16]

The aim of this study would show that predictor variables such as entomological index (existence of larvae, density of larvae, existence of eggs inside, existence of eggs outside, and existence of adult mosquitoes) and home environment (floor, wall, ceiling, ventilation, temperature, light intensity, humidity) contribute to DHF in Mataram City. This factor has a non-homogeneous and unstable nature in distribution because it is related to the characteristics of society, thus complicating the assumption that epidemiological change as a single factor. Although physical environmental factors have a high complexity of vector distribution and incidence of dengue cases, but it can be a useful tool for the preparation of scenarios for prevention of local outbreaks of DHF.[17] The results were beneficial in developing active surveillance model of DHF outbreak by the analysis of potential predictors, as well as in identifying high-risk areas for DHF outbreak, so that timely management can be achieved.

Method

The study was an observational study used case control design. The current study was conducted in the Subdictrict of Pagutan, West Pagutan and Salagalas, Mataram City from October 2019, during dry season.[18] Study population selected were all the patients diagnosed with DHF based on data from Epidemiological Investigation with a number of samples using the Lameshow and Lwanga formulas for hypothesis test for two population proportions (two-sided test) study with ratio of 90 cases and 90 controls. Then, the total sample of the populations were 180 households. The sampling technique used proportionate stratified random sampling, with households in three sub-districts as samples. Determination of the number of samples for each head of sub-village with proportional composition was then taken by systematic random sampling. The case criterion was a patient diagnosed in the last three months. Frame sampling used medical records of DHF patients based on Epidemiological Investigation (Outbreak Investigation Form) and Early

Warning System scores used by hospital. The control criterion was the closest neighbor to the case by matching the case based on age, sex and living place within a maximum of 100 meters from the patient's home.

The types of data collected were home enviroment factors, such as the room temperature that has the potential to breeding places for mosquitoes and where mosquitoes lay eggs, the room air humidity > 60%, home enviroment (floors and walls not waterproof, no ceiling or ceiling < 2.5 m, wire-free ventilation and lighting < 60 lux meters). The factors of existance and vector density based on entomology index were eggs, larvae and adult female mosquitoes. The types of instruments used are: aspirator backpack, lux meter, hygrometer, and carbondioxmeter that has been calibrated. Observation guidelines for identifying vector densities and container characteristics using vector data collection guidelines in the field compiled by National Institute of Health Research and Development, Indonesian Ministry of Health 2016. The measurement for mosquito egg density was carried out by spreading two ovitrap in each house with a total of 360 ovitraps in 180 houses.

Univariate analysis is presented in the frequency distribution values. Bivariate and multivariate analysis using simple and multiple logistic regression tests aimed at analyzing the factors associated with transmission of DHF which caused local outbreaks in Mataram City. The results of simple logistic regression analysis were used to select variables that met the criteria as candidates for the control model of local DHF outbreaks in Mataram City with p-value < 0.250.[19] The analysis was continued by multiple logistic regression tests with the backward method to find out the predictor variables in the physical environment and vector density associated with DHF transmission, the strength of the relationship between these variables and the model or formula for predicting dengue transmission in Mataram City. Model quality assessment was carried out to determine the discrimination value based on area under curve (AUC) with the receiver operating curve (ROC) method, whereas the model calibration using Hosmer and Lemeshow. The formula was stated to have good discrimination if the AUC value was closer to number 1 and was said to have a good calibration if it has a value of p-value > 0.050 on Hosmer and Lemeshow.[20] This study is part of a study approved for ethics by the Faculty of Health Science, Respati University of Yogyakarta, with Protocol Number: 167.1/UNRIYO/PL/VII/2018 on July 2018.

Results

The present study was conducted in the Subdistricts of Pagutan, West Pagutan and Salagalas, Mataram, West Nusa Tenggara. These three locations have differences with other subdistricts in Mataram City, because it is

inhabited by people coming from affects culture in Indonesia, it is included in the category of high-endemic dengue and stated to be a local outbreak of DHF in 2016-2017. Most cases in Mataram City have a record of having been diagnosed with DHF once (96.7%), male and female patients have almost the same proportion, aged 5-11 years with an education level graduating from elementary school (25.6%) and preschoolers (33.3%).

Observation and measurement of house enviroment including flooring, wall, door, ceiling, ventilation, temperature, humidity and lighting were made to obtain potential factors that favor mosquito breeding and dengue virus transmission in Mataram City are presented in Table 1. Highest wind velocities were recorded during August through December.

Table 1 shows that physical environmental factor like the condition of a house with no ceiling or with a height of < 2.5 m is related to dengue transmission and raises the risk of a local outbreak by 16 times with 95%CI = 7.237 - 36.769. Indoor and outdoor temperature of the house at 25 - 30ºC is related to dengue transmission and raises the risk of a local outbreak of 2 until 4 times with 95%CI = 1.556 - 5.215 and 1.939 - 8.914 because the temperature has the potential to become a breeding place for mosquitoes. Unavailable wire net in ventilation is related to dengue transmission and raises the risk of a local outbreak of 6 times with 95%CI = 1.758 - 22.36. Low lighting < 50 lux meters is related to dengue transmission and raises the risk of a local outbreak by 6 times with 95%CI = 1.758 - 22.360. The level of humidity in the

house > 60% is related to dengue transmission and raises the risk of a local outbreak by 18 times with 95%CI = 5.413 - 62.915. House environmental factors not significantly related to DHF transmission in Mataram City were conditions of floors, walls, temperature inside house, and humidity outside house. The existence and vector density factors of *Aedes sp.* with dengue transmission in Mataram City can be observed in three life cycles of mosquitoes, that are eggs, larvae and adult mosquitoes.

Entomology index in Mataram City based on WHO Density Figure.21 exist on scale of > 6 to 95%CI values at 30%, scale 5 for house index (HI) values, this indicates that the current area in Mataram have a very high vector density and declared vulnerable to dengue infection. The description of the presence of eggs inside and outside the house from the number of ovitrap spread was found by mosquito eggs at 50.6% and 67.2%. This value shows the level-1 classification. Description of the results of catching female *Ae. aegypti* mosquitoes in each part of the house showed any potential of mosquitoes for hunting prey and laying eggs, with an average catching result of one mosquito.

Table 2 shows that the existence of larvae is related to DHF transmission and raises the risk of a local outbreak of 3 times with 95%CI = 1.755 - 6.726. Larva density > 21% is related to DHF transmission and raises the risk of a local outbreak of 2.7 times with 95%CI = 1.132 - 6.646. The existence of eggs at home is related to transmission of DHF and raises the risk of a local outbreak by 3 times with 95%CI = 1.704 - 5.752. The

Table 1. Analysis of Home Environment Factors with Transmission of Dengue Hemorrhagic Fever

| Home Environmental | Category | Frequency | | | | OR | 95% CI | p-value |
| | | Case | | Control | | | | |
		n	%	n	%			
Flooring	Plain ground	6	6.7	3	3.3	2.07	0.502-8.552	0.497
	Plastered/ tiled/ ceramics	84	93.3	87	96.7			
Wall	Non-water resistant	3	3.3	3	3.3	1.00	0.195-5.092	1.000
	lastered, water resistant	87	96.7	87	96.7			
Ceiling	None or in several room or < 2.5 meters high	58	64.4	9	10.0	16.31	7.237-36.769	< 0.001
	Present in all room or > 2.5 meters high	32	35.6	81	90.0			
Ventilation	No wire net	87	96.7	74	82.2	6.27	1.758-22.360	0.003
	Wire net installed	3	3.3	16	17.8			
Indoor air temperature	Potential for *Aedes sp.* breeding	58	64.4	35	38.9	2.85	1.556-5.215	0.001
	Not Potential for *Aedes sp.* breeding	32	35.6	55	61.1			
Outdoor air temperature	Potential for Aedes sp. breeding	33	36.7	11	12.2	4.16	1.939-8.914	< 0.001
	Not Potential for *Aedes sp.* breeding	57	63.3	79	87.8			
Indoor air temperature	Potential in placing mosquito eggs	3	3.3	7	7.8	0.41	0.102-1.634	0.330
	Potential in placing mosquito eggs	87	96.7	83	92.2			
Light intensity	Low (< 60 Lux Meter)	50	55.6	9	10.0	11.25	5.033-25.149	< 0.001
	High (≥ 60 Lux Meter)	40	44.4	81	90.0			
Indoor humidity	High (> 60%)	35	38.9	3	3.3	18.45	5.413-62.915	< 0.001
	Low (≤ 60%)	55	61.1	87	96.7			
Outdoor humadity	High (> 60%)	27	30.0	24	26.7	1.18	0.616-2.256	0.741
	Low (≤ 60%)	63	70.0	66	73.3			

Notes: OR= Odds Ratio; CI= Confidence Interval

Table 2. Analysis of Entomology Index with Transmission of Dengue Hemorrhagic Dengue

Vector	Category	Frequency				OR	95% CI	p-value
		Case		Control				
		n	%	n	%			
Existence of larvae	Yes	40	44.4	17	18.9	3.44	1.755-6.726	< 0.001
	No	50	55.6	73	81.1			
Density of larvae	High risk (> 21%)	19	21.1	8	8.9	2.74	1.132-6.646	0.035
	Low risk/not risk (≤ 21%)	71	78.9	82	91.1			
Indoor existence of eggs	Yes	58	64.4	33	36.7	3.13	1.704-5.752	< 0.001
	No	32	35.6	57	63.3			
Outdoor existence of eggs	Yes	37	41.1	27	30.0	1.63	0.880-3.016	0.161
	No	53	58.9	63	70.0			
Existence of adult mosquitoes	Yes	30	33.3	10	11.1	4.00	1.815-8.814	0.001
	No	60	66.7	80	88.9			

Note: OR= Odds Ratio; CI= Confidence Interval

Table 3. Analysis of Physical Environment as Predictor Variables Related to Dengue Hemorrhagic Fever Transmission

Variable	β	Sig.	Exp (β)	95% CI for Exp (β)	
				Lower	Upper
Ceiling (none or in several room or < 2.5 meters high)	3.094	< 0.001	22.055	8.154	59.649
Indoor air temperature to Potential for *Aedes sp.* breeding	1.143	0.016	3.138	1.239	7.946
Light intensity (< 60 Lux Meter)	2.314	< 0.001	10.113	3.508	29.149
Indoor humadity to potential in placing mosquito eggs	1.333	0.069	3.793	0.901	15.964
Constants	-2.612	< 0.001	0.073		

Note: β = Coefficient Beta; Sig.= Significance; Exp (β)= Beta Exponential

existence of adult mosquitoes is related to DHF transmission and raises the risk of a local outbreak by 4 times with 95%CI = 1.815 - 8.814. The factor of the existence of eggs found outside the home is not related to transmission of DHF in Mataram City.

Multivariate analysis was applied to determine the type of predictor variables of physical environmental factors associated with dengue transmission and that impact on local outbreaks. There were 6 variables in bivariate analysis with p-value < 0.25 namely roof, ventilation, indoor and outdoor temperature, indoor humidity and light intensity. The analysis was complemented by a model quality test consisting of two stages, namely assessing the equality quality and the discrimination value. The model quality test results showed that environmental factors were declared feasible to predict dengue transmission in Mataram City. Forward Likelihood Ratio (LR) multiple logistic regression was applied, multi-collinearity was checked and not found, interaction was found, Hosmer Lemeshow test (p-value = 0.914), area under the ROC curve (91.3%) was applied to check the model fit.

The results of the multivariate analysis showed that the predictor variable of the physical environment of the house that affected the transmission of DHF was none or in several room or < 2.5 meters high (OR = 22.05), low house lighting (OR = 10.11), indoor air temperature to potential for *Aedes sp.* breeding (OR = 3.14) and low humidity in house (< 60%) (OR = 3.79) (Table 3).

Multivariate analysis was to determine the type of predictor variables of entomology index with DHF transmission and which had an impact on local outbreaks. There were three variables in bivariate analysis with p-value < 0.250 including existence of larvae, indoor existence of eggs and existence of adult mosquitoes (Table 4). The analysis was complemented by a model quality test consisting of two stages, namely assessing the equality quality and the discrimination value. The model quality test results show that environmental factors were declared feasible to predict dengue transmission in Mataram City. Forward LR multiple logistic regression was applied, multi-collinearity was checked and not found, Interaction was found, Hosmer Lemeshow test (p-value = 0.741), area under the ROC curve (77.5%) was applied to check the model fit.

The results of multivariate analysis showed that the dominant factors in the presence and vector density of *Aedes sp.* in the community affecting the transmission of DHF were the presence of *Aedes sp.* mosquito eggs in the house (OR = 3.34), the presence of *Aedes sp.*

Table 4. Analysis of Existence and Vector Density as Predictor Variables Related to Dengue Hemorrhagic Fever Transmission

Variable	β	Sig.	Exp (β)	CI 95% for Exp (β)	
				Lower	Upper
Existence of larvae	0.971	0.012	2.641	1.237	5.639
Indoor existence of eggs	1.206	0.000	3.340	1.745	6.390
Existence of adult mosquitoes	1.008	0.025	2.741	1.137	6.606
Constants	-2.612	0.000	0.073		

Note: β = Beta Coefficient; Sig.= Significance; Exp (β)= Beta Exponential

mosquitoes (OR = 2.74), and the presence of *Aedes sp.* larvae (OR = 2.64).

Discussion

From the preceding results, potential factors influencing occurrence of DHF in Mataram City were investigated further through observations made of the housing physical environment, existence and vector density

For house flooring, it is preferred to have plastered, or flooring made of tiles or ceramics in order to reduce room humidity, interrupting mosquito breeding cycle.[22] Flooring of plain ground will turn damp during rainy season, hence creating more humid environment suitable for mosquito breeding.[23] Similarly, plastered walls are also preferred, so that dengue-carrying mosquitoes cannot enter the house through small holes in the walls.[24] In this study, over 80% of total surveyed households, both in case and control groups have already owned houses with plastered flooring and walls. This may explain non-association between those factors and DHF occurrence in the study population.

The presence of windows, doors, roofs, and ventilation were thought to be associated with dengue virus transmission in home environment.[25] The current study results showed that over 75% of the total surveyed households had bedroom windows and doors in all the rooms. The presence of doors and windows may result in two different outcomes, namely reduced mosquito density due to reduced humidity and increased light intensity, or increased mosquito density due to presence of more entryways for mosquitoes to enter the house when they are left opened.[13,26] However, these two factors did not demonstrate association with DHF occurrence in the present study. The presence of ventilations may also have similar outcomes, if the ventilations were not installed with wire nets. The use of wire nets on ventilations for control group reached 96.7% higher than the case group at 82.2% of the total observed houses. Wire nets installed in ventilations, doors, and windows may act as barriers for mosquitoes to enter the house, preventing them to rest and to bite

residing humans inside.[27] Absence of roof may facilitate the entry of mosquitoes in houses.[28] Most houses in Mataram City do not have a barrier between the upper wall and the roof of the house. This condition is not much different from a house that has a cracked and hollow roof. The presence or the height of ceilings > 2.5 meters in control group was at 64.4% higher than the case group at 10%.

In addition, temperature, lighting, and humidity affect mosquito bionomics as well, particularly feeding behavior and mosquito development. In the present study, humidity and temperature indoor and outdoor in the case and control groups stated differently, and both did demonstrate association with the occurrence of DHF case. Environment with a temperature of 25 - 27°C is optimal for *Ae. aegypti* larvae development,[29,14] and the time required for mosquitoes to fully develop from egg to adult depends on this range of température.[30,31] Increased temperature may result in shorter time needed for mosquito development, hence increasing mosquito density and risk in transmitting dengue virus.[32] Conversely, a humidity of less than 60% causes shorter mosquito life span, decreasing their vectoral capacity as dengue vectors.[14] Most home lighting in DHF patients is < 60 lux, so it has a risk of DHF. Light intensity is the biggest factor that affects mosquito flight activities because low light and high humidity are good conditions for mosquitoes. *Ae. aegypti* mosquitoes like to rest in rather dark places in damp spaces with low light intensity.[33] Mosquitoes are likely to rest inside house because the female *Ae. aegypti* never fly far away from the place the eggs are laid.[13] Most of the rooms can be a comfortable resting place for mosquitoes, such as bedroom, living room, family room, kitchen to bathroom as long as they meet the requirements (dark and humid) as a place for mosquitoes.[34]

Measurement of larvae density levels is used to suppress the spread of dengue disease and reduce the economic and public health impacts, through a specific strategy that is to reduce mosquito breeding places to dengue vectors with bretau index (BI) < 5% and house index (HI) < 1%.[35] Based on these indicators, it can be

interpreted that Mataram City can be considered as a medium-to-high-risk area for the spread of dengue disease and has the potential to experience local outbreaks in several areas.

The high density and presence of larvae, eggs and mosquitoes were related to dengue fever in the city of Mataram. This condition was because not all communities actively participated in implementing Mosquito Nest Eradication properly. In this study, *Ae. aegypti* mosquitoes were found in bathtubs or toilets, hence according to them, it was very impractical if the bath had to be closed. The observation results in most of the respected houses found by larvae did not have good lighting in the bathroom, thus the cadre examination process was not carried out carefully and there was still an assumption that *Ae. aegypti* mosquitoes could not breed in clean water. The conditions are in accordance with the results of ra study in Sleman, Yogyakarta that the cadres activeness and accuracy in monitoring their environment are very important to prevent an increase in dengue cases.[36] Some people throw garbage in the garden and do not dispose regularly once a week, so that mosquitoes are suspected of having the opportunity to lay eggs. The implementation of this study was carried out during the rainy season, therefore, the chances of used containers filled with water were found in the yard and gardens near residential areas.

The emergence of dengue cases is caused by ineffective controls, uncontrolled population mobility, limited health infrastructure and the use of different larva indicators.[37] The entomology index (house index, building index, container index) is very influential on the value of numbers of Larva Free Index, the higher the entomology index, the lower the numbers of Larva Free Index value. Numbers of Larva Free Index that has not reached the standard indicates that the area still has the potential for dengue fever because numbers of Larva Free Index is one of the epidemiological measures often used in dengue control activities, one of which is by conducting a larva survey.[3] This is consistent with study in Tamil Nadu District, India for an early warning system of dengue epidemic that needs to be carried out by larvae surveillance. Larva surveillance is not only to determine larvae density, but also to predict transmission by monitoring mosquito-breeding sites.[38]

Conclusion

Physical environmental factors, such as the unavailable ceiling, indoor and outdoor temperature have the potential as mosquito-breeding places. Unavailable wire net on ventilation, low lighting, and high humadity are related to DHF transmission. Vector distibution with entomology index shows the exixtence of larvae, eggs and mosquitoes play a role in dengue transmission. The dominant factors affecting the transmission of dengue in Mataram City are the condition of the ceiling and the existence of mosquito eggs in the house.

The Mataram City Health Office and all primary health care need to improve monitoring of larvae survey activities carried out by larva monitors and the *3M* plus (draining, covering, burying or utilizing/recycling, and terminating larvae) movement in the community. This program greatly assists the process of monitoring the implementation of disease control program and is capable of breaking the cycle of vector breeding at an early stage. A program to measure egg density that has the potential for outbreaks can be developed as an effective DHF control effort in the community environment. This activity also needs to be supported by providing education to the community about the healthy physical environment of the house, so that it can reduce the risk of dengue transmission which has an impact on local outbreaks.

Abbreviations

SEARO: South-east Asia Regional Office; DHF: Dengue hemmorhagic fever; IR: Incidence rate; CFR: Case fatality rate; *PE: Penyelidikan Epidemiologi* (Epidemiological Investigation); AUC: Area under curve; ROC: Receiver operating curve; LR: Likelihood ratio; HI: House Index; *3M: Menguras, Menutup, Mengubur* (draining, covering, burying or utilizing/recycling); BI: Bretau Index.

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References

1. Brady OJ, Gething PW, Bhatt S, Messina JP, Brownstein JS, Hoen AG, *et al*. Refining the global spatial limits of dengue virus transmission by evidence-based consensus. PLoS Neglected Tropical Disease. 2012; 6(8): e1760.

2. Bhatt S, Gething PW, Brady OJ, Messina JP, Farlow AW, Moyes CL, *et al*. The global distribution and burden of dengue. Nature. 2013; 496(7446): 504–7.

3. Sariwati. Seminar Nasional: pengendalian penyakit tular vektor. Yogyakarta; 2017.

4. Dinas Kesehatan Kota Mataram. Profil Kesehatan Kota Mataram Tahun 2016; 2016.

5. Khan J, Khan I, Ghaffar A, Khalid B. Epidemiological trends and risk factors associated with dengue disease in Pakistan (1980-2014): a systematic literature search and analysis. PMC Public Health. 2018; 18: 745.

6. Masyeni S, Yohan B, Somia IKA, Myint KSA, Sasmono RT. Dengue infection in international travellers visiting Bali, Indonesia. Journal of Travel Medicine. 2018; 25(1): 1-7.

7. Åström, Christofer Rocklöv, Joacim Hales, Simon Béguin A, Louis, Valerie Sauerborn R. Potential distribution of dengue fever under scenarios of climate change and economic development. Ecohealth. 2012; 9(4): 448–54.

8. Cromwell et al. The relationship between entomological indicators of Aedes aegypti abundance and dengue virus unfection. PLOS Neglected Tropical Diseases. 2017; 11(3): e0005429.

9. Widiastuti D, Kesuma AP, Pramestuti N. Entomological index and transovarial transmission contribute to Dengue Haemorrhagic Fever outbreaks in Banjarnegara Regency. Spirakel. 2016; 8(1): 30–7.

10. Nadifah F, Farida Muhajir N, Arisandi D, D. Owa Lobo M. Identifikasi larva nyamuk pada tempat penampungan air di Padukuhan Dero Condong Catur Kabupaten Sleman. Jurnal Kesehatan Masyarakat Andalas. 2017; 10 (2): 172-178.

11. Pohan NR, Alvira N, Wati P, Nurhadi M. Gambaran kepadatan dan tempat potensial perkembangbiakan jentik *Aedes sp.* di tempat-tempat umum wilayah kerja Puskesmas Umbulharjo 1 Kota Yogyakarta. Jurnal Formil (Forum Ilmiah) KesMas Respati. 2016; 1(2): 109-20.

12. Astuti, Lustiyati ED. Hubungan kondisi lingkungan fisik terhadap tingkat kepadatan larva Aedes sp di Sekolah Dasar Kecamatan Bantul, DIY. Jurnal Ilmu Kesehatan Masyarakat. 2018; 9(3): 216–225.

13. Satoto TBT, Alvira N, Wibawa T, Diptyanusa A. Improvement to Early warning system the transmission of Dengue Fever through controlling potential factor in Public Elementary School at Yogyakarta. Kesmas: National Public Healh Journal. 2017; 11(4): 178-84.

14. Pascawati NA, Baskoro T, Satoto T, Wibawa T, Frutos R, Maguin S. Potential impact of climate change on dhf dynamics transmission in Mataram City. BALABA. 2019; 15(1): 49–60.

15. Wanti, Yudhastuti R, Notobroto HB, Subekti S, Sila O, Ragu, Febi. Dengue haemorrhagic fever and house conditions in Kupang City, East Nusa Tenggara Province. Kesmas National Public Health Journal. 2019; 13(4): 176-81.

16. Getachew D, Tekie H, Michael TG, Balkew M, Mesfin A. Breeding sites of Aedes aegypti: potential dengue vectors in Dire Dawa East Ethiopia. Interdisciplinary Perspectivas on Infectious Diseases. 2015; 706276: 1-8.

17. Viennet E, Scott, Craig, Williams, Helen, David. Public health responses to and challenges for the control of dengue transmission in high-income countries: case studies. PLOS Necgelted Tropical Diseases. 2016 September 19; 10(9): e0004943.

18. Dinas Kesehatan Kota Mataram. Laporan kasus DBD per tahun. Mataram; 2018.

19. Ghozali. Analisis multivariat program. Semarang: UNDIP; 2013.

20. Sopiyudin D. Statistika untuk kedokteran dan kesehatan. Jakarta: Salemba Medika. 2017; 1-181p.

21. Iriani Y. Hubungan antara curah hujan dan peningkatan kasus Demam Berdarah Dengue anak di Kota Palembang. Sari Pediatri. 2012;13(6): 378–83.

22. Centers for Disease Control and Prevention. Healthy housing reference manual. Atlanta: Department of Housing and Urban Development; 2017.

23. Day J. Mosquito oviposition behavior and vector control. Insects. 2016; 7(4): 65.

24. Powell JR, Tabachnick WJ. History of domestication and spread of Aedes aegypti--a review. Memorias do Insituto Oswaldo Cruz. 2013; 108 Suppl 1: 11–17.

25. Baskoro T, Satoto T, Diptyanusa A, Setiawan YD, Alvira N. Environmental factors of the home affect the density of Aedes aegypti (Diptera: Culicidae). YARSI. 2017; 25(1): 41–51.

26. Snyman, Florence, Victor, James, Tamara, Beth, Bryan, Hugh, Roly, Jenny, Grant. Poor housing construction associated with increased malaria incidence in a cohort of young ugandan children. American Journal Tropical Medicine and Hygiene. 2015; 92(6):1207–1213.

27. Kampango A, Bragança M, Sousa B de, Charlwood JD. Netting barriers to prevent mosquito entry into houses in southern Mozambique: a pilot study. Malaria Journal. 2013; 12(1): 99.

28. Baskoro T, Dwiputro AH, Risdwiyanto RN, Fadli UA, Alvira, Diptyanusa. Prediction model of dengue hemorrhagic fever transmis-

sion to enhance early warning system in Gergunung Village Klaten District Central Java. Journal of the Medical Science. 2019; 51(3): 258–69.

29. Reinhold JM, Lazzari CR, Lahondere C. Effects of enviromental temperature on *Aedes aegypti*: a Review. Insects. 2018; 9(4): 158.

30. Mohammed A, Chadee DD. Effects of different temperature regimens on the development of *Aedes aegypti* (L.) (Diptera: Culicidae) mosquitoes. Acta Tropical. 2011; 119(1): 38–43.

31. Muturi EJ, Blackshear M, Montgomery A. Temperature and density-dependent effects of larval environment on *Aedes aegypti* competence for an alphavirus. Journal Vector Ecolocy. 2012; 37(1): 154–61.

32. Costa EAP de A, Santos EM de M, Correia JC, Albuquerque CMR de. Impact of small variations in temperature and humidity on the reproductive activity and survival of *Aedes aegypti* (Diptera, Culicidae). Revista Brasileira de Entomologia. 2010; 54(3): 488–93.

33. Nurdiana Hayu, Trixie Salwati RA. Kejadian demam berdarah dengue berdasarkan faktor lingkungan dan praktik pemberantasan sarang nyamuk di wilayah kerja Puskesmas Srondol, Kecamatan Banyumanik, Semarang. Jurnal Kesehatan Masyarakat Indonesia. 2010; 6(1): 57–66.

34. Sari E, Wahyuningsih NE, Murwani R. Hubungan lingkungan fisik rumah dengan kejadian Demam Berdarah Dengue di Semarang. Jurnal Kesehatan Masyarakat Indonesia. 2017; 5(1): 609–18.

35. Wati NAP. Survei entomologi dan penentuan maya index di daerah endemis DBD di Dusun Krapyak Kulon Desa Panggungharjo Kecamatan Sewon Kabupaten Bantul DIY. Medica Respati. 2015; 10(3): 76–86.

36. Astuti FD, Susanti A. Perbedaan indeks entomologi pemantauan jumantik dewasa dan jumantik anak di Dusun Mejing Kidul, Ambarketawang, Gamping, Sleman, Yogyakarta. Jurnal Vektor Penyakit. 2017; 11(1): 33–42.

37. Anthony MC, Cook ADB, Amul GGH, Sharma A. Health governance and dengue in Southeast Asia. NTS Report. 2015; 2: 12-6.

38. Bhat MA, Krishnamoorthy K, Khan AB. Entomological surveillance of Dengue vectors in Tamil Nadu, India. Journal Entomology Zoology Studies. 2014; 2(6): 158–64.

Utilization of Family Planning Contraceptives among Women in the Coastal Area of South Buru District, Maluku, 2017

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Abstract

Maluku Province is one among provinces in Indonesia with a contraceptive prevalence rate (CPR) lower than the national average. This study aimed to examine factors associated with the utilization of family planning contraceptives among women of reproductive age living in the coastal area of South Buru District, Maluku, Indonesia. Data were derived from a household health survey conducted in five subdistricts in South Buru, e.g., Namrole, Leksula, Waesama, Kapala Madan and Ambalau Subdistricts on November 2017 by the Faculty of Medicine, Pattimura University in Ambon. Information on contraceptive use were collected from 390 married women aged 20 - 49 years. Bivariate and multivariate logistic regression analysis were employed to examine the factors associated with utilization of family planning contraceptives. This study found a low rate of utilization of family planning contraceptives (38.5%). The odds of utilization modern contraceptive significantly reduced among women living in Ambalau and Leksula Subdistricts, aged 41 - 49 years, those who intend to have more number of children, and with a low level of knowledge about family planning contraceptive methods.

Keywords: coastal area, contraceptives, family planning

Introduction

Although Indonesia has long been acknowledged as one of most successful countries in implementing family planning programs, the country has faced challenges in improving its contraceptive prevalence rate (CPR) in the last decade.[1,2] The use of long acting and permanent methods of contraceptives, which are more effective and efficient than short acting methods, has been consistently low for years.[2,3]

Data from the 2012 Indonesia Demographic and Health Survey show that Maluku is one of the 33 provinces in Indonesia whose CPR among married women of reproductive age was lower (40.4%) than the national average (57.9%).[2] This finding is supported by the 2013 data from the Ministry of Health of Republic of Indonesia reporting that only 38% of married women of reproductive age in Maluku used modern contraceptives.[4] Although the CPR in Maluku increased to 69% in 2016, the rate was still lower than the national average (75%).[5] In 2017, the Provincial Health Office of Maluku reported that the CPR in the province was only at 49.74% and two districts with the lowest CPR were the district of Southwest Maluku (7.28%) and South Buru

(14.7%).[6]

Previous literature shows several factors associated with non-utilization of modern family planning contraceptives.[7,8] These factors includes women's low level of education,[9,10] lack of knowledge about family planning,[7,11] side effects of contraceptive methods,[7,12] religion,[7] husband's support,[11,13] availability and accessibility of family planning services as well as skills of providers.[7,8] This finding indicates that different interventions could be carried out to improve the uptake of family planning services. Therefore, studies to examine determinants of family planning contraceptive use are still required to improve utilization of modern contraceptives in Maluku.

In 2017, the Faculty of Medicine, Pattimura University that is the only faculty of medicine located in Ambon, the capital city of Maluku Province conducted a household health survey to examine the pattern of diseases among communities living in the coastal areas of South Buru District in Maluku. One of information collected in this survey was the utilization of family planning contraceptives among married women of reproductive age. Using this available data, this study

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analyzed factors associated with the utilization of family planning contraceptive methods by women living in the coastal area of South Buru District. An understanding of these underlying factors, is expected to provide additional insights to design supportive interventions, not only in South Buru, but also in other parts of Maluku.

Method

This analysis used data derived from a household health survey carried out in five subdistricts of South Buru District, Maluku, namely Namrole, Leksula, Waesama, Kapala Madan and Ambalau Subdisricts. According to data from the Provincial Health Office of Maluku, South Buru District was one of districts with lowest CPR in the province.[6] This cross-sectional survey was conducted on November 2017 by the Faculty of Medicine, Pattimura University, Ambon.

This survey used a modified Expanded Program on Immunization (EPI) Sampling Method,[14] using 30 clusters (villages) with sub-village as the sub-cluster. The total sample size of this study was 900 respondents, which was calculated using the sample-calculating formula for descriptive research, with α = 5%, p-value = 50% (to reach maximum value), d = 0.1 and deff = 2.

Clusters (villages) were selected by using the proportionate probability to size (PPS) method, which means that the probability of selecting a cluster was proportional to its size. Subclusters (sub-villages) were selected using simple random sampling method. In each sub-village, interviewers conducted house-to-house visits until information was collected from 30 respondents. Houses in each sub-village were selected randomly by choosing the road direction, drawing the location of houses in the selected direction, followed by the selection of the first house randomly. The second house was the house whose front door is the closest to the first house's front door. A similar method was used for the third house, and so on. For this analysis, information from 390 married and nonpregnant women aged 20 - 49 years interviewed was used.

Data were collected by trained interviewers who were students and medical doctors who graduated from the Faculty of Medicine, Pattimura University. A two-day training program was held in Ambon, prior to data collection and covered different aspects of the survey, including a try-out session with the local community in the Ambon area.

Household interviews were conducted using a structured questionnaire containing various topics, namely identity of respondents, household socio-economic background, status of food security, smoking habits, history of family's disease, history of respondent's disease, history of reproduction and use of contraception (for women aged 20 - 49 years), history of medical treatment, history of traditional drug use, physical examination, and general conditions. For this analysis, variables were derived from two main sections, e.g., household socio-economic background and the records of reproduction and the use of contraceptives (specifically for women aged 20 - 49 years).

The analyzed dependent variable was the use of contraceptive (using vs. not using) and wasconstructed from two questions: (1) "Is the mother currently or has been using a contraceptive method within a month to delay or limit pregnancy?" and (2) "What is the type of contraceptive used?". If the respondent answered "yes" to the first question and reported using any type of modern contraceptives (e.g., condom, pill, injectable, intrauterine contraceptive device, implant, tubectomy or emergency contraception) in the second question, then the answer would be coded as "1" (yes, using contraceptive method). If respondent answered " no " to the first question, or answered " yes " to the first question and then answered traditional contraceptive methods to the second question, then the answer was coded as " 0 " (not using any contraceptive).

The potential predictors of family planning use were classified into three levels, namely environment, household, and individual characteristics. At the environment level, a variable indicated the subdistrict where the respondent lived. At the household level, two variables were included, e.g., household wealth index and the number of people living in the house. With the use of principal component analysis (PCA),[15] household wealth index was constructed utilizing household's facilities and assets e.g., ownership of bicycle, motorcycle, non-engine boat, engine boat, television, air conditioner, water heater, 12 kg of liquified petroleum gas (LPG), fridge, car, toilet, fuel for cooking, and source of drinking water. This index was to rank all households and further divided them into five groups (quintiles) e.g., poorest, poor, middle, rich and richest categories of households.

At the individual level, there were six variables used including age of respondent, highest educational attainments, respondent's occupation, desire for pregnancy, the number of children alive, and knowledge of family planning. Knowledge of family planning was constructed from three components, that were knowing the suitable contraceptive method to delay pregnancy (e.g., all contraceptive methods, such as condom, pills, injectables, emergency, implant, IUD (Intauterine Device), tubectomy and vasectomy), knowing the contraceptive method to limit pregnancy (e.g., implant, IUD, tubectomy and vasectomy), and knowing the duration of long acting and permanent methods (LAPMs) of contraception (implant, IUD, tubectomy and vasectomy). A score of "1" or "0" was assigned when the respondent answered the question correctly or

incorrectly, respectively. The total scores of all the three components were further summed to obtain the total score, ranging from "0" (answering all questions incorrectly), to "12" (answering all questions correctly). Finally, the scores were divided into categories of low (less than median) and high level of knowledge (equal to median or above).

In data analysis, frequency distribution tables were first developed. Second, data were analyzed using contingency tables to examine the distribution of all variables across the outcome variable. Third, bivariate logistic regression was conducted to calculate the unadjusted odds ratio (OR) of all potential predictors for utilization of family planning contraceptives without controlling for other covariates. Fourth, multivariate logistic regression was carried out to assess the association between potential predictors and utilization of family planning contraceptive, after adjusting for other variables. The association was mirrored by the adjusted OR (aOR). In multivariate analysis, backward elimination was applied to eliminate factors that are not significantly related to the use of contraceptives with a significance level of 0.05. All analyses were performed using STATA/MP 15.1 (serial number: 501506348062).

Ethics approval for the study was obtained from the Ethics Committee of the Faculty of Medicine, Pattimura

Table 1. Distribution of Respondents by Use of Contraceptive, South Buru District, Maluku Province, 2017

Variable	Category	N	%	Use of Contraceptive			
				Yes		No	
				n	%	n	%
Environmental factor	Subdistrict						
	Kapala Madan	70	17.95	41	58.6	29	41.4
	Namrole	121	31.03	49	40.5	72	59.5
	Ambalau	47	12.11	5	10.6	42	89.4
	Leksula	80	20.51	22	27.5	58	72.5
	Waesama	72	18.5	40	55.6	32	44.4
Household factor	Household wealth index						
	Poorest	86	22.0	29	33.7	57	66.3
	Poor	73	18.5	27	37.5	45	62.5
	Middle	76	19.5	30	39.5	46	60.5
	Rich	78	20	34	43.6	44	56.4
	Richest	78	20	29	37.2	49	62.8
	The number of household members						
	≤ 5 people	139	35.6	50	36.0	89	64.0
	> 5 people	251	64.4	99	39.4	152	60.6
Individual factor	Educational attainment						
	No schooling/ incomplete primary school	38	9.7	12	31.6	26	68.4
	Completed primary school	117	30	44	36.8	73	63.2
	Completed junior high school	69	17.7	36	47.8	33	52.2
	Completed senior high school	106	27.2	35	33.0	71	67.0
	Academy/ university	60	15.4	23	31.7	37	68.3
	Occupation						
	Housewife	202	51.8	71	35.2	131	64.9
	Farmer/ fisherman/ labor	122	31.3	52	42.6	70	57.4
	Civil servant/ teacher/ honorarium-based	50	12.8	20	40.0	30	60.0
	Other	16	4.1	6	37.5	10	62.5
	Age (in years)						
	21 - 30	110	28.42	49	44.5	61	55.5
	31 - 40	175	42.5	82	53.1	93	46.9
	41 - 49	102	26.4	18	17.6	84	82.4
	Desire for pregnancy						
	No/ cannot get pregnant	236	60.5	86	36.4	150	63.6
	Yes, later	124	31.8	60	48.4	64	51.6
	Yes	30	7.8	3	10.0	27	90.0
	The number of children alive						
	≤ 2	145	37.18	53	36.6	92	63.4
	> 2	245	62.82	96	39.2	149	60.8
	Knowledge of family planning[1]						
	High	128	32.8	66	51.6	62	48.4
	Low	262	67.2	83	31.7	179	68.3

Note:
[1]Knowledge of family planning consists of knowledge of the suitable contraceptive method to delay pregnancy, knowledge of the suitable contraceptive method to limit pregnancy, and knowledge of the duration of long acting and permanent methods. A high level of knowledge indicates a score of equal or above the median distribution and low level of knowledge indicates a score less than the median.

University, Ambon (Ref No. 184/FK-KOM.ETIK/VIII/2017). The research permit was obtained from the Maluku Provincial Government and the administrative leaders at study sites. Prior to the interview, the interviewers obtained signed informed consent from the respondents regarding their willingness to participate in the study.

Results

Of the 390 married and nonpregnant women of reproductive age (20 - 49 years) from South Buru District interviewed in this survey, only 38.5% (n = 149) used modern contraceptives. The short-acting method was the dominant contraceptive method. Around 83% of contraceptive users preferred injectable methods, and only slightly over 10% used LAPMs (implant, tubectomy and IUD).

The frequency distribution of respondents involved in this analysis is shown in Table 1. More than 42% respondents graduated from senior high school or higher; and more than half were housewives. Notably, more than 60% of respondents intended to limit their pregnancy. The study also found that. approximately, two-thirds of respondents had a low level of knowledge (less than the median score).

The lowest proportion of respondents using modern contraceptives was found in Ambalau Subdistrict (10.6%) (Table 1). Respondents aged 41 years and older

Table 2. Results of Bivariate Analysis for Factors Associated with Utilization of Modern Contraceptive Methods in Coastal Community in South Buru District, Maluku Province, 2017

Variable	Category	OR	95% CI	p-value
Environmental factor	Subdistrict			
	Kapala Madan	1.00		
	Namrole	0.48	0.26 - 0.88	0.017
	Ambalau	0.08	0.03 - 0.24	< 0.001
	Leksula	0.27	0.14 - 0.53	< 0.001
	Waesama	0.57	0.29 - 1.10	0.093
Household factor	Household wealth index			
	Poorest	1.00		
	Poor	1.18	0.61 - 2.27	0.621
	Middle	1.28	0.67 - 2.43	0.448
	Rich	1.52	0.81 - 2.86	0.195
	Richest	1.16	0.61 - 2.21	0.644
	Number of household members			
	≤ 5 people	1.00		
	> 5 people	1.16	0.75 - 1.78	0.499
Individual factor	Educational attainment			
	No schooling/ incomplete primary school	1.00		
	Completed primary school	1.26	0.60 - 2.85	0.563
	Completed junior high school	2.36	1.16 - 6.11	0.043
	Completed senior high school	1.07	0.48 - 2.36	0.871
	Academy/ university	1.35	0.57 - 3.18	0.497
	Occupation			
	Housewife	1.00		
	Farmer/ fisherman/ labor	1.37	0.86 - 2.17	0.180
	Civil servant/ teacher/ honorarium-based	1.23	0.65 - 2.32	0.523
	Other	1.10	0.39 - 3.17	0.850
	Age (in years)			
	21 - 30	1.00		
	31 - 40	1.10	0.68 - 1.77	0.703
	41 - 49	0.27	0.14 - 0.50	< 0.001
	Desire for pregnancy			
	No/cannot get pregnant	1.00		
	Yes, later	1.64	1.05 - 2.54	0.029
	Yes	0.19	0.06 - 0.66	0.008
	The number of children alive			
	≤ 2	1.00		
	> 2	1.12	0.73 - 1.71	0.605
	Knowledge of family planning[1]			
	High	1.00		
	Low	0.44	0.28 - 0.67	< 0.001

Note:
OR = odds ratio; CI = confidence interval; [1]Knowledge of family planning consists of (a) knowledge of the suitable contraceptive method to delay pregnancy; (b) knowledge about the suitable contraceptive method to limit pregnancy; and (c) knowledge about the duration of long acting and permanent methods (LAPMs). A high level of knowledge indicates a score of equal or above the median distribution and low level of knowledge indicates a score less than the median.

had the lowest percentage of contraceptive use (17.6%). The proportion of respondents using family planning contraceptives was lower among respondents with a low level of knowledge (31.7%) than those with a high level of knowledge (51.6%).

From bivariate analysis (Table 2), factors associated with the use of family planning services were subdistrict, respondent's age, desire for pregnancy, and knowledge of contraceptive methods. However, in this bivariate model, only the relationship between each potential variable and study outcome was examined, without controlling for other covariates.

Multivariate logistic regression analyses (Table 3) indicate that the respondents from Ambalau (aOR = 0.11, 95%CI = 0.03 - 0.31, p-value < 0.001) and Leksula (aOR = 0.32, 95%CI = 0.14 - 0.62, p-value = 0.002) were less likely to use contraceptives than those living in Kapala Madan Subdistrict. Respondents aged 41 - 49 years were 80% less likely to use modern contraceptives (aOR = 0.21, 95%CI = 0.10 - 0.46, p-value < 0.001) than those aged 21 - 30 years. The likelihood of using contraceptive among respondents intending to get pregnant reduced significantly (aOR = 0.09, 95%CI = 0.02 - 0.34, p-value < 0.001) compared with those who would like to limit pregnancy. The important role of knowledge in family planning contraceptive use was clearly shown in the analysis. The odds of contraceptive use among respondents who had a low level of knowledge about contraceptive was almost 60% less than the odds of contraceptive use among respondents

with a high level of knowledge (aOR = 0.44, 95%CI = 0.27 - 0.72, p-value = 0.001).

Discussion

This study found a low uptake of family planning contraceptive methods among women living in the coastal area of South Buru District in 2017. The use of contraceptives was dominated by non-Long Acting / Permanent Methods (non-LAPM) of contraceptives, particularly the injectable methods. The use of contraceptives reduced significantly among women living in Ambalau and Leksula Subdistrict, women aged 41 - 49 years, those intending to have more children, and those with a low level of knowledge of family planning contraceptive methods. These results might be used to assist policy and decision makers to design and implement effective and evidence-based interventions to improve the use of contraceptive methods in South Buru District.

The area where respondents lived had a significant association with the uptake of family planning services. Ambalau is an island separated from the main island of Buru, and access to it is challenging during certain times beacuse sea access is the only entry point to this area. Given that the limited access and availability of family planning services could negatively affect the utilization of family planning services, as reported in other studies,[7-9] this issue should be taken into account by both service providers and users. However, the local condition might become a strong motivation for providers to promote the

Table 3. Results of Multivariate Analyses for Factors Associated with Utilization of Modern Contraceptive Methods in Coastal Community in South Buru District, Maluku Province, 2017[1]

Variable	Category	aOR	95%CI	p-value
Environmental factor	Subdistrict			
	Kapala Madan	1.00		
	Namrole	0.48	0.26 - 0.88	0.017
	Ambalau	0.08	0.03 - 0.24	< 0.001
	Leksula	0.27	0.14 - 0.53	< 0.001
	Waesama	0.57	0.29 - 1.10	0.093
Individual factor	Age (in years)			
	21-30	1.00		
	31-40	1.10	0.68 - 1.77	0.703
	41-49	0.27	0.14 - 0.50	<0.001
	Desire for pregnancy			
	No/cannot get pregnant	1.00		
	Yes, later	1.64	1.05 - 2.54	0.029
	Yes	0.19	0.06 - 0.66	0.008
	Knowledge of family planning[2]			
	High	1.00		
	Low	0.44	0.28 - 0.67	< 0.001

Note:

aOR = adjusted Odds Ratio; CI = Confidence Interval; [1]Backward elimination method was used to retain only variables significantly related to the study outcome (significance level of 0.05 was applied); [2]Knowledge of family planning consists of (a) knowledge about the suitable contraceptive method to delay pregnancy; (b) knowledge about the suitable contraceptive method to limit pregnancy; and (c) knowledge about the duration of long-acting and permanent methods. A high level of knowledge indicates a score of equal or above the median distribution and a low level of knowledge indicates a score of less than the median.

use of LAPM particularly among those intending to delay or even limit pregnancy. To improve LAPM use, several factors should be considered, such as improving the knowledge and skills of providers; demanding creation within the community, addressing misconceptions on LAPM; and ensuring the availability of supplies and equipment required for LAPM services.[16]

As shown in previous literature, age in this study was a significant predictor of contraceptive use.[17,18] Women aged 41 - 49 years had a reduced likelihood of using contraceptive methods. Although they were still within the reproductive age range, some women might think that they no longer need any contraceptive methods as they become less fecund.[17] Strengthening family planning education programs is thereby still important, not only for young mothers, but also for those aged 40 years and older. In adition, health workers should also be encouraged to use every contact opportunity to improve the awareness of women and their spouses awareness of reproductive health and family planning programs.

The study finding emphasized the role of knowledge of family planning contraceptives in the community of South Buru District. This condition supports findings from other studies regarding the importance of improving women's knowledge to increase the uptake of family planning methods.[7,11,19] Activities to enhance community knowledge on family planning are still crucial. Different awareness-raising interventions could be implemented because they are reportedly effective for demand creation.[8,16,20] The use of information, education and communication materials, such as banners or posters on family planning issues, in addition to behavior change communication strategies were reportedly beneficial in improving knowledge of family planning services.[8,21] A study showed that a presentation on family planning at different social events, such as community meetings of women, men, and youth, could improve utilization.[22]

Apart from group-based interventions, interpersonal communication plays a key role. A study in Uganda showed that counseling programs that involve letting women see and touch family planning contraceptive, or encouraging health workers to use all contact opportunities to counsel women about family planning, such as during antenatal or postnatal care, could beneficially improve family planning uptake.[23] Nevertheless, providers should have sufficient knowledge and skills to conduct effective counseling sessions. A qualitative study from other areas of Indonesia showed that many health workers and family planning providers had not attended any counseling training programs.[24] Considering the limited available training programs, on-the-job training might be an alternative and will help

increase the number of providers trained to provide good-quality services.

Previous literature showed the important role of partners in family planning programs.[9,13,25] Women who discuss contraceptive methods with their spouse are more likely to use modern contraceptives. Encouragement and, most essentially, approval from their husband are highly valued by women.[9] Couples counseling, promotional activities with men's groups or mass media campaigns could be conducted to improve the husband's or other family members' awareness.[26]

Intersectoral collaboration is also a key factor in family planning programs, particularly between government and private sectors.[27] Private sectors could assist in developing effective promotional and counseling materials tailored to the local condition and culture, facilitating training programs for providers, or expanding family planning services, particularly LAPM, during specific events.

This study has some strengths and limitations. As the study was designed to represent the coastal area of South Buru, the results could be used to plan interventions to improve the uptake of family planning services. The sample size used in this study was adequate to examine different potential predictors of family planning use, starting from the environment, household, to the individual-level factors. However, some limitations should also be noted. Given that this was a cross-sectional survey, the analysis could not show any cause-and-effect relationship between the variables. The information provided by respondents was also not validated, as it was merely based on the women's recall ability. Some variables that might be potentially related to the low utilization of family planning services were not examined because they are unavailable in the dataset. These variables include support from the husband and other family members, the quality of family planning services, and the availability of contraceptives in the area. Nonetheless, these limitations are unlikely to reduce the validity of the analysis.

Conclusion

Overall, the use of family planning services in women living in the coastal area of South Buru District remains low and is highly dominated by non-LAPMs, particularly injectable methods. The study finds several significant predictors for family planning, including the subdistrict where the women live, age, fertility intention, and women's knowledge of family planning contraceptives.

Recommendation

Efforts to encourage utilization of LAPM services will be beneficial for communities in areas with limited access to family planning services, or irregular and frequently

disrupted contraceptive supplies. Health promotion programs and awareness raising activities are required to improve the community's knowledge of family planning, targeting not only the youth, but also women aged 40 years and older, as well as women's spouses and other family members. Activities to improve providers' knowledge and counseling skills are also essential to support the demand creation. Intersectoral collaboration should be encouraged to assist the local government of South Buru District to improve access to and the quality and quantity of family planning services.

Abbreviations

CPR: Contraceptive Prevalence Rate; LAPMs: Long Acting and Permanent Methods; EPI: Expanded Program on Immunization; PPS: Proportionate probability to size; PCA: Principal Component Analysis; LPG: Liquified Petroleum Gas; IUD: Intrauterine Device; aOR: adjusted Odd Ratio.

Ethics Approval and Consent to Participate

Ethics approval for the study was obtained from the Ethics Committee of the Faculty of Medicine, Pattimura University, Ambon (Ref No. 184/FK-KOM.ETIK/VIII/2017). The research permit was obtained from the Provincial Government of Maluku Province, as well as the administrative leaders from study sites. Prior to the interview, the interviewers obtained signed informed consent from the respondents regarding their willingness to participate in the study.

Competing Interest

Author declares that there are no significant competing financial, professional, or personal interests that might have affected the performance or presentation of the work described in this manuscript.

Availability of Data and Materials

The data that support the findings of this study are available from Faculty of Medicine, Pattimura University, Ambon but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of Faculty of Medicine, Pattimura University, Ambon.

Authors' Contribution

Christiana Rialine Titaley designed the study and performed data analysis; Christiana Rialine Titaley and Ninik Sallatalohy prepared, reviewed and revised the manuscript. Both authors read and approved the final manuscript.

Acknowledgment

References

1. Hayes A. The status of family planning and reproductive health in Indonesia: a story of success and fragmentation. In: family planning in Asia and the Pacific: addressing the challenges. Selangor, Malaysia: International Council on Management of Population Programmes. 2012; 225-41.

2. Statistics Indonesia, National Family Planning Coordinating Board, Ministry of Health Republic of Indonesia, ORC Macro. Indonesia Demographic and Health Survey 2012. Calverton, Maryland: BPS and ORC Macro; 2013.

3. World Health Organization, Johns Hopkins Bloomberg School of Public Health/Center for Communication Programs (CCP), USAID. Family planning: a global handbook for providers Baltimore, MD; Geneva, Switzerland: CCP and WHO; 2011.

4. National Institute of Health Research and Development Ministry of Health, Republic of Indonesia. Basic Health Research 2013: National Report 2013. Jakarta: National Institute of Health Research and Development, Ministry of Health, Republic of Indonesia; 2013.

5. Pusat Data dan Informasi Kementerian Kesehatan RI. Data dan Informasi: profil kesehatan Indonesia 2016. Jakarta: Pusat Data dan Informasi Kementerian Kesehatan RI; 2017.

6. Health Office of Maluku Province. Routine report of family health of Maluku Province. Ambon: Provincial Health Office of Maluku; 2017.

7. Blackstone SR, Nwaozuru U, Iwelunmor J. Factors influencing contraceptive use in sub-saharan Africa: a systematic review. International Quarterly of Community Health Education. 2017; 37(2): 79-91.

8. Mwaikambo L, Speizer IS, Schurmann A, Morgan G, Fikree F. What works in family planning interventions: a systematic review. Studies in Family Planning. 2011; 42(2): 67-82.

9. Eliason S, Awoonor-Williams JK, Eliason C, Novignon J, Nonvignon J, Aikins M. Determinants of modern family planning use among women of reproductive age in the Nkwanta District of Ghana: a case-control study. Reproductive Health. 2014; 11(1): 65.

10. Jalang'o R, Thuita F, Barasa SO, Njoroge P. Determinants of contraceptive use among postpartum women in a county hospital in rural Kenya. BMC Public Health. 2017; 17(1): 604.

11. Haider TL, Sharma M. Barriers to family planning and contraception uptake in Sub-Saharan Africa: a systematic review. International Quarterly of Community Health Education. 2013; 33(4): 403-13.

12. Apanga PA, Adam MA. Factors influencing the uptake of family planning services in the Talensi district, Ghana. Pan African Medical Journal. 2015; 20: 10.

13. Sekoni OO, Owoaje ET. Factors associated with family planning uptake among women in South West Nigeria. Contraception. 2013; 88(2): 315-6.

14. Chao LW, Szrek H, Peltzer K, Ramlagan S, Fleming P, Leite R, Magerman J, Ngwenya GB, Pereira NS, Behrman J. A comparison of EPI sampling, probability sampling, and compact segment sampling

methods for micro and small enterprises. Journal of Development Economics. 2012; 98(1): 94-107.

15. Smits, J., Steendijk, R. Social indicators research in: the International Wealth Index. 2015; 122: 65.

16. World Health Organization. Strategies to increase use of long-acting and permanent contraception in: From Evidence to Policy: Expanding Access to Family Planning; 2012.

17. Mandiwa C, Namondwe B, Makwinja A, Zamawe C. Factors associated with contraceptive use among young women in Malawi: analysis of the 2015-16 Malawi demographic and health survey data. Contraception and Reproductive Medicine. 2018; 3: 12.

18. Godfrey EM, Chin NP, Fielding SL, Fiscella K, Dozier A. Contraceptive methods and use by women aged 35 and over: a qualitative study of perspectives. BMC Women's Health. 2011; 11: 5.

19. Titaley CR, Ariawan I, Damayanti R, Ismail A, Saputri AY, Yelda F, et al. Poor knowledge and nonuse of long-acting/permanent pethods of contraceptives in six districts in Indonesia. Asia Pacific Journal of Public Health. 2017; 29(8): 660-72.

20. Speizer IS, Corroon M, Calhoun L, Lance P, Montana L, Nanda P, Guilkey D. Demand generation activities and modern contraceptive use in urban areas of four countries: a longitudinal evaluation. Global Health: Science and Practice. 2014; (4): 410-26.

21. Krenn S, Cobb L, Babalola S, Odeku M, & Kusemiju B. Using behavior change communication to lead a comprehensive family planning program: the Nigerian urban reproductive health initiative. Global Health: Science and Practice. 2014; 2(4): 427–43.

22. Amo-Adjei J, Mutua M, Athero S, Izugbara C, Ezeh A. Improving family planning services delivery and uptake: experiences from the "reversing the stall in fertility decline in western kenya project". BMC Research Notes. 2017; 10: 498.

23. Birungi R, Byabagambi J, Rahimzai M. Improving the quality of family planning services in Uganda: tested changes implemented in four districts of western Uganda. Published by USAID Applying Science to Strengthen and Improve Systems (ASSIST) Project. Bethesda, MD: University Research Co., LLC (URC); 2016.

24. Titaley CR, Wijayanti RU, Damayanti R, Setiawan AD, Dadun, Dachlia D, et al. Increasing the uptake of long-acting and permanent methods of family planning: a qualitative study with village midwives in East Java and Nusa Tenggara Barat Provinces, Indonesia. Midwifery. 2017; 53: 55-62.

25. Mekonnen W, Worku A. Determinants of low family planning use and high unmet need in Butajira District, South Central Ethiopia. Reproductive Health. 2011; 8: 37.

26. US Agency for International Development, Family Health International, Progress. Increasing men's engagement to improve family planning programs in South Asia North Carolina USA: FHI. 2012.

27. Munroe E, Hayes B, Taft J. Private-sector social franchising to accelerate family planning access, choice, and quality: results from marie stopes international. Global Health: Science and Practice. 2015; 3 (2): 195-208.

Determinants of Stunted Children in Indonesia: A Multilevel Analysis at the Individual, Household, and Community Levels

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Abstract

This study aimed to examine the risk factors of childhood undernutrition in Indonesia. Determinants of childhood stunting were examined by using the 2013 Indonesia Basic Health Research Survey dataset. A total of 76,165 children aged under 5 years were included in this study. The analysis used multivariate multilevel logistic regression to determine adjusted odds ratios (aORs). The prevalence of stunting in the sample population was 36.7%. The odds of stunting increased significantly among the under-five boys, children living in slum area, and the increase of household member (aOR = 1.11, 95 %CI: 1.06–1.15; 1.09, 95%CI: 1.04–1.15; and 1.03, 95%CI: 1.02–1.04 respectively). The odds of stunting decreased significantly among children whose parents more educated (aOR = 0.87, 95 %CI: 0.83–0.91 and 0.87, 95%CI: 0.83–0.9, respectively), who live in urban area, in a province with higher Gross Domestic Product (GDP) per capita, and in a province with higher ratio of professional health worker per 1,000 population aged 0-4 years (aOR = 0.85, 95%CI: 0.81–0.89; 0.89; 95%CI: 0.79–1.00; and 0.99; 95%CI: 0.99–1.00, respectively). The study found that stunting was resulted from a complex interaction of factors, not only at the individual level, but also at household and community levels. The study findings indicate that interventions should implement multi-level approaches to address various factors from the community to the individual level.

Keywords: children, multilevel regression, stunting, undernutrition

Introduction

Childhood undernutrition is an ongoing problem in many developing countries. Approximately, 159 million children under 5 years of age were estimated to be stunted worldwide in 2014; this statistic is an indicator of chronic undernutrition.[1] Childhood stunting has considerable human and economic costs.[1] It increases the risk of child death, adversely affects child development and learning capacity, increases the risk of infections and non-communicable diseases, and reduces productivity and economic capability in adulthood.[2-4] Hence, global efforts have been directed toward the development of policies and programs aimed at reducing stunting. Reducing childhood stunting is the first of six goals in the Global Nutrient Targets for 2025 and a key indicator in the second Sustainable Development Goals (SDGs) to Achieve Zero Hunger.[5,6]

Despite such efforts, however, childhood stunting remains at a high level and continues to be a serious public health problem in Indonesia, in which progress in reducing childhood undernutrition has been slow over the past decade. A previous report published in 2013 indicated that over one-third (37%) of children under 5 years of age are approximately stunted, while 18% are estimated severely stunted.[7] Indeed, Indonesia even ranked the fifth among countries with the highest burden of stunted children.[8]

A child's nutritional status is largely determined by his or her dietary intake, disease exposure, and treatment, which in turn, they are affected by several individual, household, and community factors.[9] Many previous studies emphasized the importance of socio-economic, demographic, household, environmental factors, parental characteristics, child health and feeding practice factors, and geographical locations on childhood nutrition status.[10–13] Prior studies in Indonesia on factors associated with stunting indicated that maternal education,[14,15] poverty,[15] and water and sanitation,[16] were associated with stunting.

Although many scholars have examined risk factors for childhood undernutrition in Indonesia and many other developing countries, most of the work done thus

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far focuses on individual-level factor affecting stunting rather than community-level factor. Studies focusing only on individual-fixed effect factors could ignore group membership and concentrate exclusively on inter-individual variations and on individual-level attributes.[17] Such studies, would, thus, tend to disregard the potential importance of group-level attributes in influencing individual-level outcomes. The risk of stunted growth and development is affected by the context in which a child is born and raised.[18] Including interdependent influences, such as the political economy, health and health care, education, society and culture, agriculture and food systems, water and sanitation, and the environment. Moreover, if outcomes for individuals within groups/communities are correlated, the assumption of independence of observations is violated, resulting in incorrect standard errors and inefficient estimates.[19,20] A multilevel study design allows the simultaneous examination of the effects of group and individual-level predictors.[19,20] Thus, the present study was designed to identify both the individual and community-level factors contributing to stunting in Indonesia.

Method

This study used data from the 2013 National Basic Health Research dataset. The 2013 National Basic Health Research is a periodic community-based research initiated in 2007 that aims to collect basic data and health indicators depicting health conditions at the national, provincial, and district/municipality levels. It is designed as a descriptive cross-sectional survey. This survey used a three-stage sampling technique by probability proportional to size (PPS) to select a sample of 300,000 households spread across 33 provinces and, 497 districts/municipalities in Indonesia.[21] In this study, the unit of analysis was children under five years old living with both of their parents. Given this limitation, 76,165 children under 5 years and living within 66,917 households and 33 provinces were eligible for inclusion in this study.

The nutritional status of children under 5 years of age was assessed from their age and body length/height. The height of children aged < 2 years was measured while they were in a recumbent position, while the height of children aged ≥ 2 years was measured while they were in a standing position using length/height measuring tools with a precision of 0.1 cm.[22] The scores of height-for-age of children were converted into standardized value (Z-score) using the anthropometric standards of the WHO. Children with a Z-score of < -2 standard deviations relative to height-for-age WHO standards were defined as being stunted.[22]

The individual, household, and community-level variables included in this study as explanatory variables, along with the corresponding coding definitions, are shown in Table 1. Here, individual-level variables include children characteristics (level one), household-level variable describe the cluster of children living in the same household (level two), and community-level variable describe the cluster of communities living in the same provincial living environment (level three). These three hierarchical levels were used to create a multilevel analysis of the study. Communities were based on sharing a common primary sampling unit within the 2013 National Basic Health Research data.

This study used a three-level regression model (level 1: individual; level 2: household; level 3: provincial) to estimate the effects of predictors on the risk of childhood undernutrition after controlling for other confounding factors. Children living in the same community and belonging to the same household may be more similar to each other than individuals from different communities and different households. Thus, the multilevel regression model was used to adjust correlated individual responses because the same household is nested under a single community.[19,20]

Multilevel models recognize the existence of data hierarchies by allowing for residual components at each level in the hierarchy. For example, a two-level model

Table 1. Definition of Variables

Category	Variable	Definition
Individual level	Sex of children	Categorized into (1) male and (0) female.
	Vaccination status	Categorized into (1) ever vaccinated and (0) no.
Household level	Slum dwelling	Categorized into (1) yes and (0) no.
	Father's education	Categorized into (1) senior high school or higher and (0) less than senior high school.
	Maternal education	Categorized into (1) senior high school or higher and (0) less than senior high school.
	Household wealth	Categorized into (0) (first and second quintiles) (poorest); (1) (third quintile) (middle; and (2) (fourth and fifth quintiles) (richest).
	Number of household member	Continuous
Community level	Type of residence	Categorized into (1) urban and (0) rural.
	Log GDP per capita	Continuous
	Poverty rate	Continuous
	Ratio of professional health worker per thousand population aged 0-4	Continuous

that allows for grouping of child outcomes within households could include residuals at the child and household level. Thus, the residual variance is partitioned into a between-household component (e.g., the variance of the household-level residuals) and a within-household component (e.g., the variance of the child-level residuals). Household residuals, which are often called "household effects", represent unobserved household characteristics affecting child outcomes. These unobserved variables lead to correlations among outcomes for children from the same household.

Data analysis was carried out by using STATA version 16.0 (StataCorp, College Station, Texas, USA) statistical software, and the results of the multivariate analysis were reported as adjusted odds ratio (aORs) with p-values and 95% CIs.

Results

In total, 76,165 children aged 0 - 4 years and living in 66,917 households within 33 provinces were analyzed in this study. Approximately 36.7% of the children were stunted. The sample characteristics are presented in Table 2.

The results of multilevel logistic regression models for individual, household, and community level factors are displayed in Table 3. A child's sex, type of residence (urban or rural), parental education (mother and father), household wealth, slum area residence, number of household member, Gross Domestic Product (GDP) per capita, and ratio of professional health worker per 1,000 population aged 0 - 4 years were important risk factors influencing childhood stunting at the individual,

household, and community levels.

Boys had higher odds ratio (ORs) of being stunted (aOR = 1.11; 95% CI: 1.06-1.15) compared with girls. The odds of being stunted were higher (aOR = 1.09; 95% CI: 1.04-1.15) among children living in slum areas compared with children not living in slum areas. Children whose mothers graduated from senior high school or higher were less likely to be stunted compared with children whose mother did not graduate from senior high school (aOR = 0.87; 95% CI: 0.83 – 0.91). Children whose fathers graduated from senior high school or higher were also less likely to be stunted compared with those whose fathers did not graduate from senior high school (aOR = 0.87; 95% CI: 0.83 – 0.91). The risk of being stunted decreased with an increase in household wealth, and the ORs were lowest in children who belong to the richest households. The risk of being stunted was increased with increasing number of household member (aOR = 1.03; 95% CI: 1.02 – 1.04).

Children living in urban areas were by 15% less likely to be stunted compared with children living in rural areas (aOR = 0.85; 95% CI: 0.81 – 0.89). Children living in a province with higher GDP per capita had decreased odds to be stunted than those who lived in a province with lower GDP (aOR = 0.89; 95% CI: 0.79 – 1.00). Finally, children living in a province with a higher ratio of professional health workers per 1,000 population aged 0 - 4 had decreased odds to be stunted than those who lived in a province with a lower ratio of these health workers (aOR = 0.99; 95% CI: 0.99 – 1.00).

Discussion

In this study, the prevalence of stunting in the sample

Table 2. Sample Characteristics

Characteristic	Category	Stunted			
		Yes		No	
		n	%	n	%
Individual level					
Sex of the child	Male	14,522	52.0	24,220	50.2
	Female	13,405	48.0	24,018	49.8
Vaccination status	Yes	24,490	87.7	43,293	89.7
	No	3,437	12.3	4,945	10.3
Household level					
Slum dwelling	Yes	5,272	18.9	8,005	16.6
	No	22,655	81.1	40,233	83.4
Father's education	Senior high school or higher	8,600	30.8	18,779	38.9
	Less than senior high school	19,327	69.2	29,459	61.1
Maternal education	Senior high school or higher	7,200	25.8	16,052	33.3
	Less than senior high school	20,727	74.2	32,186	66.7
Household wealth	Richest	9,453	33.8	22,225	46.1
	Middle	5,371	19.2	9,217	19.1
	Poorest	13,103	46.9	16,796	34.8
Community level					
Type of residence	Urban	10,937	39.2	2,343	4.9
	Rural	16,990	60.8	24,808	51.4

Table 3. Multilevel Analysis of Individual, Household, and Community-level Characteristics and Childhood Stunting Status

Characteristic	Category	aORs	95% CI
Individual level			
Sex of the child	Male	1.11[a]	1.06-1.15
	Female [r)]	1.00	
Vaccination status	Yes	1.02	0.96-1.08
	No [r)]	1.00	
Household level			
Slum dwelling	Yes	1.09[a]	1.04-1.15
	No	1.00	
Father's education	Senior highs school or higher	0.87[a]	0.83-0.91
	Less than senior high school [r)]	1.00	
Maternal education	Senior high school or higher	0.87[a]	0.83-0.91
	Less than senior high school [r)]	1.00	
Household wealth	Richest	0.62[a]	0.59-0.66
	Middle	0.82[a]	0.78-0.87
	Poorest [r)]	1.00	
Number of household member		1.03[a]	1.02-1.04
Community level			
Type of residence	Urban	0.85[a]	0.81-0.89
	Rural [r)]	1.00	
Log GDP per capita		0.89[c]	0.79-1.00
Poverty rate		1.01	1.00-1.02
Ratio of professional health worker per thousand population aged 0 - 4 years		0.99[c]	-0.01-0.00

Note:
[a] $p < 0.01$; [b] $p < 0.05$; [c] $p < 0.10$; [r)] reference; aORs: adjusted Odds Ratio; CI: Confidence Intervals; GDP: Gross Domestic Product

population was 36.7% which indicates that childhood under-nutrition in Indonesia requires urgent attention. A child's sex, parental education (mother and father), household wealth, type of residence (urban or rural), slum area, and number of household member are important risk factors influencing childhood undernutrition. This study also revealed that community (provincial)-level variables, such as GDP per capita and ratio of professional health workers per 1,000 population aged 0 - 4 years, as proxies for economic and health development exerts independent effects on childhood undernutrition exceeding the effects of individual and household-level variables.

This study found that vaccination status exerted no significant effect on childhood undernutrition; it was likely that the proxy used to measure the vaccination status was only ever-vaccinated status, regardless of the completeness of basic vaccination in children (due to limited data).

The study found that male children were more likely to be stunted than their female counterparts. This finding is consistent with previous studies.[13,23,24] Male children are believed to be more physically active and to expand more energy that should have been channeled to increase growth.[20]

This study further revealed that childhood stunting was inversely related to the maternal education level, which was in line with findings in previous studies.[13,14,23-25] Maternal education affects child nutrition via multiple pathways. Higher educational levels, for example, can be associated with higher knowledge. Mothers with nutritional knowledge acquired in the community have been reported to choose a more diversified diet for their children and utilize food more effectively than those without.[26] This type of knowledge could also increase responsive feeding/care, which improves child health and nutrition.[27] Educated mothers are more likely to take leadership positions in community structures and influence child care practices at their homes and communities than those who are not.[18] In addition, keeping girls in school longer can delay the age of marriage and first birth, reduce the demand for children, and empower women to make decisions that they might not otherwise make, such as having fewer and more evenly spaced births, and making better use of modern health services.[25]

Childhood stunting was also found to be inversely related to the father's level of education and household's wealth status. This finding is consistent with previous studies.[13,14,23-25] Poverty affects a child's nutritional status through insufficient food intake, increased exposure to infections, and a lack of basic health care.[13] A father's higher education level also translates to a higher household income and food security.[28]

The study also found that higher numbers of household members increase the risk of stunting.

Children living in slum areas had higher odds to be stunted than children who did not. Children living in highly-dense household environment without sanitation were exposed to more fecal pathogens than children who did not.[29] Such exposure could impede the nutrient absorption of children.

This study provides a good example of how childhood undernutrition cannot be entirely explained by individual-level factor. It reveals that children living in a province with higher GDP per capita and a province with a higher ratio of professional health worker per 1,000 populations aged 0 - 4 years are less likely to be stunted than those who do not.

The relationship between increased national income and nutrition functions is through two complementary channels. When economic growth stimulates average incomes, populations may spend a larger part of their incomes on the consumption of health and nutrition-relevant goods and services.[30,31] Increased GDP may also boost the provision of nutrition-relevant services and social and health infrastructures because richer governments are more capable of dedicating higher public spending towards these investments.[30,31]

Deployment of community health workers in the community is associated with households' better management of child illness, specifically the treatment of child fever and non-use of antibiotics in home treatment of diarrhea.[32] Women are most likely than men to access the health care system during the first 1,000 days. Such contact provides opportunities for nutritional and health interventions to improve birth outcomes, and to place and keep children on the path to healthy growth.[18] Hence, a higher ratio of professional health workers per 1,000 populations aged 0 - 4 years could lead to lower risks for undernutrition in children.

The study showed that children whose parents resided in rural areas have higher odds of childhood stunting than those living in urban areas, likely becuse the latter have better-equipped urban health-care systems and greater access to health-care facilities. Moreover, urban populations usually have a higher educational level and economic status.[17]

This study has several strengths. First, the study used a nationally-representative household survey with large-scale sample size and broad geographic coverage as a dataset. Second, the study used multilevel regression estimation to enable the simultaneous examination of the effects of individual, household, and community-level risk factors on the risk of individual childhood undernutrition. Multilevel analysis provides an efficient means to link traditionally-distinct ecological/community levels and individual-level studies and overcomes the limitations inherent in focusing on only one level.

In terms of limitations, however, the use of secondary data restricted the ability to include other variables related to childhood undernutrition.

Conclusion

This study shows that stunting is resulted from a complex interaction of individual, household, and community-level factors, all of which contribute to a high prevalence of childhood undernutrition in Indonesia. A child's sex, parental education (mother and father), household wealth, type of residence (urban or rural), slum area residence, and number of household member are important risk factors for childhood undernutrition. This study also reveals that community (provincial)-level variables, such as GDP per capita and ratio of professional health worker per 1,000 population aged 0 - 4 years, as proxies to economic and health development, are also important risk factors for childhood undernutrition. The study findings indicate the need for integrated interventions to reduce stunting rate in Indonesia. Interventions should use multilevel approaches to address various factors from the community to the individual level. A strong required effort to improve educational level, for both men and women, is uncovered. Efforts made to promote higher education will help improve a child's nutritional status by empowering women, which can lead to better child care practices, and by improving household economic status, which is essential for better food intake, less exposure to infections, and better use of health care services. Boosting economic growth is also essential to improve a child's nutritional status through a higher consumption of health and nutrition-relevant goods and services by households and the government. Increasing the number of professional health workers in community is also essential to ensure the accessibility of health care services, which can improve children's nutritional status within the community.

References

1. International Food Policy Research Institute. Global nutrition report 2016: from promise to impact: ending malnutrition by 2030. Washington, DC; 2016.

2. Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, de Onis M et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. Lancet. 2013; 382(9890): 396.

3. Martins VJB, Toledo Florêncio TMM, Grillo LP, Do Carmo P. Franco M, Martins PA, Clemente APG, et al. Long-lasting effects of undernutrition. International Journal of Environmental Research and Public Health. 2011; 8 (6): 1817–46.

4. Stewart CP, Iannotti L, Dewey KG, Michaelsen KF, Onyango AW. Contextualising complementary feeding in a broader framework for stunting prevention. Maternal and Child Nutrition. 2013; (9): 27–45.

5. World Health Organization. Maternal, infant, and young child nutrition. The sixty-fifth world health assembly WHA65.6. Geneva, Switzerland: 2012.

6. Sustainable Development Goals Knowledge Platform [homepage on the Internet]. Sustainable Development Goal 2.

7. Tim Nasional Percepatan Penanggulangan Kemiskinan. 100 Kabupaten/Kota prioritas untuk intervensi anak kerdil (Stunting). Jakarta; 2017.

8. United Nations Children's Fund. Improving child nutrition: the achievable imperative for global progress. UNICEF: New York; 2013.

9. United Nations Children's Fund. UNICEF's approach to scaling up nutrition for mothers and their children. New York: Discussion paper. Programme Division, UNICEF; 2015.

10. Kimani-Murage EW, Muthuri SK, Oti SO, Mutua MK, van de Vijver S, Kyobutungi C. Evidence of a double burden of malnutrition in urban poor settings in Nairobi, Kenya. Nugent RA, editor. PLoS One. 2015; 10 (6): e0129943.

11. Asfaw M, Wondaferash M, Taha M, Dube L. Prevalence of undernutrition and associated factors among children aged between six to fifty nine months in Bule Hora district, South Ethiopia. BMC Public Health. 2015; 15 (1): 41.

12. Magadi MA. Household and community HIV/AIDS status and child malnutrition in Sub-Saharan Africa: evidence from the demographic and health surveys. Social Science & Medicine. 2011; 73 (3): 436–46.

13. Ntenda PAM, Chuang YC. Analysis of individual-level and community-level effects on childhood undernutrition in Malawi. Pediatrics and Neonatology. 2018; 59 (4): 380-9.

14. Handayani F, Siagian A, Aritonang EY. Mother's education as a determinant of stunting among children of age 24 to 59 months in North Sumatera Province of Indonesia. IOSR Journal Of Humanities and Social Science. 2017; 22 (9): 58–64.

15. Kusumawati E, Rahardjo S, Sari HS. Model of stunting risk factor

16. Torlesse H, Cronin AA, Sebayang SK, Nandy R. Determinants of stunting in Indonesian children: evidence from a cross-sectional survey indicate a prominent role for the water, sanitation and hygiene sector in stunting reduction. BMC Public Health. 2016; 16 (1): 1–11.

17. Gebru KF, Haileselassie WM, Tomesgen AH, Seid AO, Mulugeta BA. Determinants of stunting among under-five children in Ethiopia: a multilevel mixed-effects analysis of 2016 Ethiopian demographic and health survey data. BMC Pediatrics. 2019; 19: 176.

18. Casanovas MC, Lutter C, Mangasaryan N, Mwadime R, Hajeebhoy N, Aguilar AM et al. Multi-sectoral interventions for healthy growth. Maternal & Child Nutrition. 2013; 9: 46-57.

19. Hox JJ. Quantitative methodology series. Multilevel analysis: techniques and applications. 2nd edition. Routledge/Taylor & Francis Group; 2010.

20. Goldstein H. Multilevel statistical models. 4th edition. Wiley, London; 2010.

21. Ministry of Health and National Institute of Health Research and Development. National report on basic health research, Riskesdas, 2013. Jakarta: NIHRD; 2014.

22. Perumal M, Bassani BG, Roth DE. Use and misuse of stunting as a measure of child health. The Journal of Nutrition. 2018; 148 (3): 311-15.

23. Akombi BJ, Agho KE, Hall JJ, Merom D, Astell-Burt T, Renzaho AMN. Stunting and severe stunting among children under-5 years in Nigeria: a multilevel analysis. BMC Pediatrics. 2017; 17 (1): 1–16.

24. Chirande L, Charwe D, Mbwana H, Victor R, Kimboka S, Issaka AI, et al. Determinants of stunting and severe stunting among under-fives in Tanzania: evidence from the 2010 cross-sectional household survey. BMC Pediatrics. 2015; 15: 165.

25. Alderman H, Headey DD. How important is parental education for child nutrition? World Development. 2017; 94: 448–64.

26. Burchi F. Child nutrition in Mozambique in 2003: The role of mother's schooling and nutrition knowledge. Economics and Human Biology. 2010; 8: 331–45.

27. Shieh SJ, Chen HL, Liu FC, Liou CC, Lin YI, Tseng HI et al. The effectiveness of structured discharge education on maternal confidence, caring knowledge and growth of premature newborns. Journal of Clinical Nursing. 2010; 19: 3307–13.

28. Rosiyati E, Pratiwi EAD, Poristinawati I, Rahmawati E, Nurbayani R, Lestari S, et al. Determinants of stunting children (0-59 months) in some countries in Southeast Asia. Journal of Community Health. 2018; 4 (3): 88-94.

29. Budge S, Parker AH, Hutchings PT, Garbutt C. Environmental enteric dysfunction and child stunting. Nutrition Reviews. 2019; 77 (4): 240–253.

30. Biadgilign S, Shumetie A, Yesigat H. Does economic growth reduce childhood undernutrition in Ethiopia? PLoS One. 2016; 11(8).

31. Mary S. How much does economic growth contribute to child stunting reductions?. Economies. 2018; 6 (4): 55.

32. Perez F, Ba H, Dastagire SG, Altmann M. The role of community health workers in improving child health programmes in Mali. BMC International Health and Human Rights. 2009; 9: 28.

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