

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 source of 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

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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 Northern region as it is most populous district of Northern Punjab. Districts of Faisalabad and Sheikhpura 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, Sheikhpura 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 (km ²)	Population (2017)	Density (people/km ²)	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	Sheikhpura	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 > chi²= 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 > chi²= 0.0000, Pseudo R² = 0.33
 (*significant at p-value < 0.01) (**significant at p-value < 0.05) (***)significant at p-value < 0.1), HRFA: Availability 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 Error	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 > chi² = 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: Availability 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.

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