

Socio-economic status and diabetes control in patients presenting to Princess Marina hospital (PMH), Gaborone, Botswana.

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Declaration

I, Dr Violet Baruti, student number 14758040, the undersigned, hereby declare that the work contained in this assignment is my original work and that I have not previously submitted it in any form, at any university for a degree. I also declare that ethics approval for the study was obtained from the Health Research Ethics Committee of Stellenbosch University (Reference number: N11/09/286).

Signed:

Date: 11/08/14



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Signature:  Date: 17/11/14”

ABSTRACT

Background

Literature supports a relationship between low income status and poor diabetes control. However this relationship has not been assessed in Botswana.

Aim

To determine the relationship between socio-economic status and diabetes control in patients presenting to PMH.

Objectives

To measure the degree of glycaemic control; to determine the relationship between glycaemic control and monthly income as well as between glycaemic control and lifestyle modification factors; to describe the relationship between glycaemic control and core social welfare indicators.

Methods

A cross-sectional study, conducted over a 3 months in Gaborone, The questionnaire assessed self-care activities, monthly household earnings and core social welfare indicators among diabetes patients attending PMH. A total of 240 patients were randomly selected to complete the questionnaire. Routine HbA1c values were studied alongside questionnaire responses.

Results

A total of 58 (24%) participants with HbA1c between 4.0%-7.0% were well controlled, 96 (40%) of participants were poorly controlled (7.1%-9.0%) and 86 (36%) in the very poorly controlled category with HbA1c >9.0%.

Of the well-controlled category, 59% lived on a monthly income between P0-P5000(the lowest income bracket). Only 3% participants in this category earned above P20000 monthly (the highest income bracket). Of the 40% poorly controlled participants, 69% fell in the lowest income bracket. No participants in this poorly controlled category earned above P20000 monthly. There were 40% participants in

the very poorly controlled category. Of these, 63% earned between P0 - P5000. Only 2 participants with HbA1c values of 9.1 earned above P20000.

Conclusion

In this study high HbA1c percentages were associated with low monthly income levels and low scores in lifestyle modification factors. Participants with poor access to core welfare indicators also had poor glycaemic control. This study suggests that poor socio-economic status is directly related to poor glycaemic control in patients attending PMH diabetes clinic.

INTRODUCTION

Diabetes is one of the most prevalent chronic diseases of our time making it an important chronic disease. A total of 246 million people have been estimated to be living with type 2 diabetes worldwide, with this number predicted to escalate to 380 million by the year 2025 if current trends persist.[1] The literature states that the majority of these new cases will be in developing countries. In 2007, 10 million was the estimated number of people living with diabetes in Africa and this is projected to increase to 19 million by 2025. [1]

The medical world has identified that well controlled blood glucose levels have a positive impact on preventing the complications of diabetes.[1] Sexual dysfunction has been identified as a complication of diabetes affecting more men than women. Sexual dysfunction is culturally unacceptable in some African communities, hence the stigma associated with the disease. As a result of this stigma, many psychosocial problems have also been identified. [1]

Complications such as, blindness, neuropathy, cerebral vascular accidents and cardiovascular incidents are serious clinical conditions and often lead to physical impairments and disability. [1] Moreover, previous studies have shown that diabetes has an economic impact on the general population with the greatest impact in those with a low socio-economic status. [2]

Controlling blood glucose levels involves the use of therapy, healthy eating, physical activity, as well as urine and blood tests for monitoring glucose levels. [2] Management may be experienced as quite complicated by patients, especially where the level of education is low and in poor communities where patients are of low socio-economic status. [2]

The knowledge of cultural beliefs and norms is also important as it can shed light on the dietary patterns, physical activity patterns and readiness to adopt healthier lifestyles of any society, if needed. [3] Exercise, blood glucose control, weight loss and knowledge about diabetes affect diabetic control. [4, 5] Educational attainment has been directly linked to levels on HbA1c, which is an indicator of diabetes control. [6,7,8]

The highest prevalence of type 2 diabetes has been shown to be in women, older people, the less educated and those with a low socio-economic status. [9] In these sections of the population, weight and exercise by patients with diabetes serve as contributing factors to the development of type 2 diabetes. There was also lack of knowledge as to whether diabetes could be prevented among this group. [10]

People living with diabetes in poor communities with food insecurity often rely on the intake of cheap, energy loaded carbohydrates, instead of a regular diabetic diet, thus leading to poor diabetic control and elevated blood glucose levels.[11,12] It has also been shown that in low socio-economic status, the prevalence of pre-diabetes is higher than has been reported previously. [13,14] Parikh and Gilmer found that mortality and complications of diabetes were higher among the low income ethnic groups.[13,15]

Self-belief about overall health, which tends to be poorer in low income status groups, is an indicator of diabetes control. [4,16] Populations where the greatest impact of chronic illness is being experienced have been found to be naturally the least represented and difficult to engage in research. This was found to be due to cultural views on health and distrust of the study. [17] The heavy impact of chronic illness could be attributed to the low socio economic status often prevailing in these sections. [17] Heavy adverse effects from diabetes and lack of representation of the

Gaborone population in internationally conducted studies, made it necessary to conduct a study assessing the relationship between socio economic status and glycaemic control in the area. Populations with a low socio-economic status have been shown to have poor diabetes control in general. [12,18,19] As already mentioned, complications from diabetes and generally poor diabetic control are generally higher in low socio-economic status. [20,21] Furthermore Nelson and Songer showed poor diabetic monitoring to exist in those without medical insurance in one USA study. [22,23]

Improved communication in low income settings can influence risk perceptions about diabetes complications. [24] Low income earners have been shown to respond better to diabetic control, in a telephone intervention study, which was intended to show that better communication in low socio-economic status will improve diabetes control. [24, 25]

Provision of health insurance and economic empowerment in low income groups have been shown to improve diabetes control. [6, 19, 22, 26] Efforts are therefore needed to facilitate diabetes self-management activities in low income earners by using culturally familiar educational methods. [27] Improved education on diabetes through interactions among diabetes patients and health providers improve health care. [28] When this high risk group of low income earners is identified and educated on diabetes, the likelihood of at the preventing of poor glycaemic control can then be increased. [28] Through routine diabetes monitoring, the patient's knowledge about the state of their glycaemic control would be determined. This will assist in making further appointments where continued monitoring and education will be done to prevent long term complications related to poor glycaemic control. [28]

AIM

To determine the relationship between socio-economic status and diabetes control in patients presenting to Princess Marina Hospital, Gaborone, Botswana.

OBJECTIVES

1. To measure the degree of glycaemic control
2. To determine the relationship between glycaemic control and monthly income levels.
3. To determine the relationship between glycaemic control and lifestyle modification factors.
4. To describe the relationship between glycaemic control and core social welfare indicators.

METHODS

Design: A cross-sectional survey study, using a questionnaire based quantitative method.

Poor diabetes control was defined as any diabetes patient with HbA1c values exceeding 7% as assessed over the study period of three months and good diabetes control as HbA1c level 7% and less. [9] This study population was divided into the well-controlled, poorly controlled and very poorly controlled sections as shown in Table 1. Low income was defined as any individual living on less than 1 US dollar (about P6) per day.[29] Based on similar studies conducted internationally as mentioned in the introduction, socio-economic status has been described by assessing both the social and economic aspects. Collective questionnaire information on lifestyle parameters of diet, exercise, adherence to diabetes medication and diabetes monitoring has been studied and compared with HbA1c values. The core social welfare indicators have also been studied alongside the HbA1c values and the relationship with each social component explored. Monthly income levels were compared to the HbA1c values and the relationship with the economic component described.

Setting

The population for this study was patients with diabetes presenting to the medical outpatient clinic at PMH, which is a government referral hospital situated in Gaborone.

Table 1: HbA1c values and the interpretation on the levels of control

| HbA1c values | Interpretation on the level of control |
|---------------------|---|
| 4.0%-7.0% | Well controlled |
| 7.1%-9.0% | Poorly controlled |
| 9.1% and above | Very poorly controlled |

However, the hospital also serves as a level 1 primary health care centre for the city residents since it is the only public hospital in the area. The medical outpatient department houses the diabetic clinic, where the study was conducted. Not all patients selected for the study were referrals. Local patients presenting to the diabetes clinic were also included. About 500 adult diabetic patients, predominantly from the local Botswana population and a few expatriates, attend the clinic. Setswana and English are the main languages of communication. There were no adolescents included in this study since they had been transferred to a pediatric endocrinology clinic. The hospital services are provided free of charge with only a one time registration fee of five Pula (P5), an equivalent of 0.71 USD. Since this is a government facility in the public sector, the more affluent sections of the Gaborone community were mostly visiting private hospitals and hence their minimal representation in the study population.

Sample selection

The help of a statistician at Stellenbosch University and the Epi info programme were used to assist with the calculation of an appropriate sample size. A sample of 240 diabetes patients was calculated assuming that there was a 50% diabetes prevalence in Gaborone since the exact figures were then unknown. From the

estimated 500 medical records which were available, a random sample was selected to obtain the 240 participants needed for the study.

Inclusion /exclusion criteria

1. Only individuals consenting to participate in the study were included.
2. Participants must have been diagnosed with type 2 diabetes and no age restrictions were imposed.
3. Individuals native to Gaborone or those who have been in the area for a minimum of 1 year were included.
4. Only patients whose medical records were accessible through the medical diabetic clinic were included, since part of the data was obtained from the medical records.
5. Terminally ill patients were excluded.

Questionnaire validation

The researcher decided to adopt the validated diabetes Self-Care Activities Questionnaire which has also been used in a previous local study.[30] The questionnaire was then modified with the addition of entries on HbA1c values, monthly income levels and core social welfare indicators.[31] Lifestyle modification factors of diet, exercise, monitoring and medication, have been used in numerous international studies to assess socio-economic status and diabetes control. Piloting was done by systematic random sampling of 10 participants who were then not included in the actual study.

Self-care activities scores

The diabetes self-care activities questionnaire individual scores were recorded and the values shown in Table 3. The maximum possible score was 73 and the minimum zero (0). High scores indicated better levels of self care activities. Scores in the first and second rows were interpreted as very poor and poor respectively. Scores of 40-49 were labeled as good with the range of scores from 50-59 earning

a very good interpretation in terms of how well the self-care activities were being followed. An excellent grade was awarded to scores of 60 and above as per the questionnaire calculations. The Stanford English Diabetes, Self-management study questionnaire scoring criteria was used as a reference to interpret the scores.[30]

Data collection

Patients were provided with the questionnaire available in either Setswana or English, the two official languages of choice. The study conductors (two doctors and one nurse) at the clinic were responsible for the issuing of the questionnaires. Instructions were given to the participants in a language of their choice. This was done by the study conductors who were available for any further questions from the participants.. The principle investigator then gathered all the questionnaires and captured the responses. Furthermore, HbA1c values were recorded from the participants' diabetes clinic files. The HbA1c results were always on record having been collected during the routine clinic visits. The clinic has a laboratory responsible for determining HbA1c levels .The HbA1c values were obtained for all the participants and the values used were not older than 6 months for all participants.

Data analysis

Information on self-care activities was studied alongside HbA1c values and the relationship examined. Monthly income levels were also analyzed and compared to the HbA1c values to assess any relationship. The availability of core social welfare indicators were described in relation to the HbA1c values. With the help of a statistician, p values were calculated and an interpretation on the data made.

Ethical considerations

Strict confidentiality of the questionnaire information and medical records was maintained and the participants were informed of this in simple language, both verbally and in written format. No monetary incentives were granted. Importantly, the participants were also informed that there would be no penalty should they seek to drop out during the course of the study. An informed choice to participate

was made by all the participants since participation was voluntary and anonymity was honored.

RESULTS

The study population consisted of 240 people, with 52% female and 48% male participants. The population consisted mainly of elderly type 2 diabetic patients approaching retirement or already retired, taking up 70% of the study population. The remaining 30% comprised of participants in their thirties. This could be explained by the fact that the middle aged population preferred the private sector, while the retired population depended on the public sector.

Table 2: HbA1c values and monthly income levels of the study population.

| Income levels (Pula) | Number of participants and percentage /240 | Good control HbA1c (4.0%-7.0%) N=58 n (%) | Poor control HbA1c (7.1%-9.0%) N=96 n (%) | Very poor control HbA1c (9.1%and above) N=86 n (%) | p value |
|-----------------------------|---|--|--|---|----------------|
| 0-5000 | 154 (64.2%) | 34 (58.6%) | 66 (68.8%) | 54 (62.8%) | 0.002 |
| 5001-10000 | 50(20.8%) | 14 (24.1%) | 18 (18.8%) | 18 (20.9%) | 0.004 |
| 10001-15000 | 26(10.8%) | 6 (10.3%) | 12 (12.5%) | 8 (9.3%) | 0.13 |
| 15001-20000 | 6(2.5%) | 2 (3.4%) | 0 (0.0%) | 4 (4.7%) | 0.001 |
| > 20000 | 4(1.7%) | 2 (3.4%) | 0 (0.0%) | 2 (2.3%) | 0.001 |

A total of 65% of the study population had been diagnosed with diabetes for 10 years or more, with the remaining 35% having been diagnosed with the disease for less than 10 years. Botswana citizens from varying economic backgrounds accounted for 90% of the population and the remaining 10% was comprised of expatriates working in the city.

Table 3-Questionnaire scores on self-care activities and levels of glycaemic control.

| Questionnaire scores | Number of participants Per range and percentage/240 | HbA1c | | | |
|--------------------------|--|--|---|--|---------|
| | | Good control 4.0%-7.0% N=126 n(%) | Poor control 7.1%-9.0% N=56 n(%) | Very poor control >9.1% N=58 n(%) | p value |
| 20-29(very poor) | 9(4.0%) | 0(0.0%) | 0(0.0%) | 9(15.5%) | 0.029 |
| 30-39(poor) | 3(1.0%) | 1(0.8%) | 0(0.0%) | 2(3.4%) | 0.029 |
| 40-49(good) | 66(27.5%) | 28(22.2%) | 28(50.0%) | 10(17.2%) | 0.029 |
| 50-59(very good) | 72(30.0%) | 32(25.4%) | 15(26.8%) | 25(43.1) | 0.0003 |
| 60 and above (excellent) | 90(37.5%) | 65(51.6%) | 13(23.2%) | 12(20.7%) | 0.0001 |
| | Total=240 | | | | |

Table 2 below indicates the number of participants per HbA1c range with corresponding monthly income levels. There was a notable disparity in the

representation of individuals earning above P20000, who were only 4 in total. This table thus shows that low monthly income earners generally showed high HbA1c levels.

Table 2 shows that most of the respondents were in the lowest income group and that within this group there were significantly more of the patients with poor and very poor control. This result may suggest an indirect relationship between monthly income levels and HbA1c values.

Table 3 shows the questionnaire scores indicating the level of self-care activities. The number of participants per given score interval was recorded alongside the ranges of HbA1c values they fell under.

The lowest score range of 20-29 gave the highest percentage of individuals with very poorly controlled HbA1c values of 9.1% and above, with all individuals in this category having very poor glycaemic control thus also the lowest number of well controlled participants at 0. Of note, in the excellent level of self-care activities consisting of scores of 60 and above, only 12 individuals out of the 90 in this category were very poorly controlled at a statistically significant (13%) and the highest percentage of the well-controlled with 65 participants of the 90 in total (72%), also realized in this score range. A direct relationship between self-care activities scores and glycaemic control is thus suggested.

Questionnaire information on how well the participants had access to the core social welfare indicators is summarized in Table 4 below. For each welfare indicator modality as defined by the Botswana Statistics office, the number of individuals having access to it was recorded alongside the categories of the HbA1c values (Table 4).

Table 4 further shows the total number of individuals in each core welfare indicator, where N=240. The number and percentage of participants per each HbA1c range is also presented.

Table 4-Access to Core welfare indicators and the level of glycaemic control.

| Indicator | Total number of participants per given modality and percentage (240) | Good control (4.0-7.0%) N=137 n(%) | Poor control (7.1%-9.0%) N=50 n(%) | Very poor control > 9.1% N=53 n(%) | p values |
|--|---|---|---|--|-----------------|
| Education | | | | | |
| Primary | 41 (17%) | 10 (7.3%) | 7 (14.0%) | 24 (45.3%) | 0.00008 |
| High School | 175 (73%) | 120 (87.6%) | 36 (72.0%) | 19 (35.8%) | 0.00007 |
| Tertiary level | 24 (10%) | 7 (5.1%) | 7 (14.0%) | 10 (18.9%) | 0.01 |
| Utilities (All three: water, electricity and housing) | 215 (90%) | 7(100%) | 30 (100%) | 108 (100%) | 0.00007 |
| Employment and Resources | | N=119 n(%) | N=25 n(%) | N=96 n(%) | |
| White collar jobs | 216 (90%) | 110 (92.4%) | 24 (11%) | 82 (85.4%) | 0.042 |
| Blue collar jobs | 24 (10%) | 9 (7.6%) | 1 (4%) | 14 (14.6%) | 0.042 |
| Information and technology | | N=240 n(%) | N=240 n(%) | N=240 n(%) | |
| Radio | 240 (100%) | 156 (65%) | 22 (9.2%) | 62 (25.8%) | <0.05 |

| | | | | | |
|-----------------|-----------|-------------|-------------|------------|-------|
| TV | 125 (52%) | 53 (22.1%) | 53 (22.1%) | 19 (7.9%) | <0.05 |
| Internet | 36 (15%) | 24 (10.0%) | 7 (2.9%) | 5 (2.1%) | <0.05 |
| Cellular phones | 221 (92%) | 149 (62.1%) | 28 (11.73%) | 44 (18.3%) | <0.05 |

Education

Participants with a high school level of education, who were 175 in total, had the highest percentage of the well-controlled HbA1c values at a statistically significant 87.6%, with the lowest percentage of the very poorly controlled at 35%. Only 7.3% in those with primary school education were well controlled. From the entire very poorly controlled individuals when assessing this indicator, 45.3% had a primary school level of education. A direct relationship between the level of education and glycaemic control is suggested by this finding.

Utilities

From the 215 total of participants who recorded access to water, electricity and housing, 77 of them were well controlled and a notable 108 experienced very poor glycaemic control. However, 30 individuals in this category had poor control. The availability of these utilities did not show to improve glycaemic control in this study.

Employment and resources

Statistically significant data was obtained showing that of the entire participants with good glycaemic control, 92.4% were from the White collar job category with only 7.6% representing the portion of those with blue collar jobs. More than half the total number of those with blue collar jobs had very poor glycaemic control as compared to only 82 of the 216 with white collar jobs. A direct relationship is suggested between this modality and glycaemic control.

Information and technology

Considering the data under access to radio, 65% of individuals with access had well controlled HbA1c values with only 25.8% of them having a very poor glycaemic control. With regard to internet services availability the results reflected that 66%

(24/36) of participants with access were well controlled and contributed only 2.1% of the very poorly controlled. Exploring access to cellular phones, 62.1% of those with cellular phones had well controlled glycaemia and contributed only 18.3% of the entire very poorly controlled group under this modality. A direct relationship between information/technology availability and glycaemic control is therefore suggested.

Statistical analysis

As some of the cells contain the value zero, the statistician used the Fisher's exact chi-square test for the analysis of the data. For the calculation of the p values in Table 2, only the values of n equals or greater than 6 were considered due to the programme used therefore results in the last 2 rows where some of the cells contained zeros were merged. Comparing any 2 rows yielded $p < 0.05$, thus statistically significant data. The third row was the only exception where $p = 0.13$.

For Table 3, the first 3 rows were merged since the first two cells contained zeros, which made it difficult to calculate p values if the merging was not done. Comparing any 2 rows therefore gave $p < 0.05$ which was statistically significant.

Statistically significant data was also obtained for Table 4 as indicated by the exact p values given.

DISCUSSION

When studying the results pertaining to the income levels, it was found that participants with low monthly earnings experienced high HbA1c values, suggesting poor diabetes control. This finding compares well with findings by Rimmer, Silverman and Quin, who indicated that low socio-economic groups had the highest level of poor diabetes control. [9] It implies that low income may be related to the ability of individuals to effectively acquire optimum measures needed for diabetes control.

Considering the core social welfare indicators as provided by the Botswana statistics office, the results suggest that culturally available modalities and the level of access the participants had per indicator, may be related to diabetes control. It was

interesting to note that under the modality of education, participants with a high school level of education had a significantly better level of glycaemic control than those who only reached primary school level. This finding may suggest that the level of education contributes towards glycaemic control since more educated individuals may understand diabetes control better and may be more likely to employ the required measures to achieve this. In this regard similar findings by Shai and Jiang, Schillinger, Barton, Karlet, Wang et al and Mull with Nguyen, indicated that educational attainment was directly linked to levels of HbA1c, which is in support of this study finding. [6,7,8]

Of note in this study was the fact that individuals with white collar jobs had better glycaemic control than manual workers (blue collar jobs). This finding supports that by Rimmer, Silverman, Braunschweig, Quin et al, who showed that low socio-economic groups had poor diabetes control. [9] Considering the core welfare indicator of information and technology, the suggestion was that glycaemic control was noticeably better where there was access to radio, internet and cellular phones. These media provide a culture of modern communication technology where patients with diabetes can easily access information on diabetes control to consolidate their diabetes education base. Walker and Schechter have shown that low income earners respond better to diabetes control when given better information and communication facilities, hence a support of the findings under information and technology in the study. [3] The results suggest that there was a direct relationship between access to the mentioned core welfare indicators and glycaemic control.

However, access to utilities appeared to affect glycaemic control in a negative manner, since most of the participants with access to water, electricity and housing had very poor control This differs from research conducted by Rimmer, Silverman, Brauschweig, Quin et al (2002) which linked low socio-economic status to poor diabetes control. [9] The argument here can be that this single modality under utilities does not solely define socio-economic status .The study did not test how effectively and how frequently the utilities were used. Furthermore some bias or misunderstanding in reporting access to the utilities by some of the participants may have been present.

On further scrutiny of the diabetes lifestyle modification factors given by self-care activities scores, it was interesting to note that glycaemic control was significantly better in participants with an excellent adherence to the lifestyle modification factors and significantly worse in those with a very poor adoption of the lifestyle modification factors. This may suggest that a combination of the lifestyle modification factors affect diabetes control. Hopper and Schechtman showed that controlling blood glucose levels involves the use of medication, healthy eating, exercise and monitoring glucose levels. [2] This study result support their finding, showing that excellent adoption of lifestyle modification factors yielded better glycaemic control.

However it may appear overly simplistic to emphasize the relationship between poor diabetes control and poor socio-economic circumstances as these are not the only factors predictive of poor control. The study also revealed cases where very poor glycaemic control was recorded in the highest monthly income bracket. This differs from studies conducted by Seligman and Millstein which linked only low socio-income groups to the consumption of cheap high carbohydrate food, as an example of a poor lifestyle modification factor. [9, 12] A possible explanation can be that poor dietary patterns are not only linked to low income, but also to the individual's level of knowledge about diabetes control or even culturally preferred food. More importantly it is rather a combination of these lifestyle modification factors which contribute to glycaemic control. Furthermore McAndrew and Horowitz et al (2010) and Heisler and Piette, et al (2005) have shown that, knowledge about diabetes affect glycaemic control. [4,5]

The study findings suggest a relationship between glycaemic control and socio-economic status as reflected in the culturally relevant core welfare indicators, lifestyle modification factors (self-care activity scores) and monthly income levels.

While these study findings may further assist in hypotheses generation with regard to diabetes control, further studies are recommended to establish the described relationship definitively.

LIMITATIONS

A number of factors were observed which contributed to the study limitations, therefore an explanation for possible confounding factors. During sample size calculation, only an estimate of the prevalence of diabetes in Gaborone was used to calculate the needed sample size in order to assess whether poor diabetes control was directly linked to low socio-economic status in the study population. The actual sample size needed could have been different if the prevalence of diabetes in Gaborone only, was known. Furthermore, participants were giving the information themselves and there could have been recall bias in some cases. Even though thorough explanation on how to complete the questionnaires was given to all participants to eliminate education as a cofounding factor, there could still have been an element of it affecting the final results. It could have proven beneficial to have included a younger age group (Type 1 diabetes) of participants, to compare core welfare modalities like information and education with the level of use in the older generation. This was not possible since type 1 patients were enrolled at a different facility not under the PMH management. The study population was mostly middle and lower social groups since private clinics dealt with the more affluent group of patients thus limiting their number in the study. The study population consisted of only 30% of the younger generation which was also a notable limitation.

RECOMMENDATIONS

Considering the study results which indicate that there is a relationship between low self-care activities scores and poor diabetes control, it can be recommended that patient education on dietary patterns, diabetes monitoring, adherence to diabetes medication and exercise be emphasized. Participants with low monthly income levels experienced poor diabetes control and therefore it is important for policy makers to pay more attention to diabetes patients and explore ways of socio-economically appropriate education for these groups .There is enough reason to improve access to core welfare indicators since the results suggest that there is a relationship between these core welfare indicators and diabetes control.

CONCLUSION

In this study high HbA1c percentages were associated with low monthly income levels and low scores in lifestyle modification factors. Participants with poor access to core welfare indicators also had poor glycaemic control. It can be suggested from the study that poor socio-economic status is directly related to poor glycaemic control in patients presenting to PMH diabetes clinic.

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