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Prevalence of Type 2 Diabetes Mellitus and Associated Risk Factors among Local Government Workers at Bariadi Town Council, Tanzania, A Cross Section Study 2017

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Abstract

***Background**: Although the government-initiated interventions to address the risk of diet-related non-communicable diseases, the prevalence of T2DM is still high, we conducted this study to determine the magnitude of T2DM and associated risk factors among health workers in Bariadi Town Council Tanzania.*

***Methodology**: A cross-sectional study approach was applied for 229 participants. Qualitative variable was measured using proportion and quantitative variable were measured using mean and median. Strength of association was assessed by Odds Ratios with their corresponding 95% confidence interval. Both bivariable and multivariable logistic regression was used.*

***Results**: The overall prevalence was found to be 7.9% (95%CI=4.7-12.1). Risk factors for T2DM were found to be sex (OR=4.545, 95%CI: 1.069-19.325), age between 30-41 and 41-50 years (OR=8.08, 95%CI: 1.215-53.741; OR=15.08, 95%CI: 2.315-98.342) and history of raised blood sugar (OR=0.032, 95%CI: 0.006-0.167).*

***Conclusion**: Prevalence of T2DM was found to be high, female having higher than male. Sex, age, history of diabetes had significant association with T2DM. Control efforts should be directed on screening and public nutrition programmes.*

***Keywords:** Diabetes Mellitus; Non-Insulin; Risk factors; prevention.*

Background

Diabetes Mellitus is a disease characterized by high levels of glucose in the blood. Worldwide the prevalence of diabetes was estimated to be 9.0% among adults in 2014. About 1.5 million deaths were caused by diabetes; and more than 80% of deaths occurred in developing countries [1].

In Africa the prevalence of diabetes mellitus was 4.9% as in 2013. It was projected to increase from 19.8 million in 2013 to 41.5 million people in 2035. In Tanzania, prevalence of diabetes mellitus was 8.0% during 2012. It was estimated that more than 1.7 million people with diabetes mellitus and about 1.3 million people were living undiagnosed [2]. It was higher among urban dwellers, over 5.0% more than the rural counterpart who accounts about 2.0% [3]. The prevalence of T2DM is increasing rapidly within the country, and the increase is associated closely with the change of dietary habits and lifestyles from a traditional to a sedentary, western lifestyle, which leads to overweight and obesity [3].

Despite the increase in prevalence of diabetes mellitus, most studies and interventions to address the disease are being directed to rural areas and towards health facilities, leaving aside public workers and, the diagnosis is done once the person faces complications [4].

Although the government initiated interventions to address the risk of diet-related non-communicable diseases, the prevalence of T2DM is still higher 8.0% and is estimated that, there are over 80% of undiagnosed people [2, 3].Its burden is higher in the working population having negative impact on the health of the workforce, undermine productivity and adversely affecting national

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economies as well as compromising social and family welfare [5].We conducted this study to determine the prevalence of Type 2 Diabetes Mellitus and associated risk factors among Local Government Authority workers at Bariadi Town Council, Tanzania.

Methods and materials

Study area and population

This was a cross-sectional study design conducted in Bariadi Town Council among Local Government Authority workers in Simiyu Region, Tanzania. The total population of Bariadi Town Council was 155 620 (NBS, 2014).

Sample size

The sample size for the study was estimated using the formula:
$[n=Z^2*P\ (Q)*N/\ e^2\ (N-1) + (Z^2*P\ (Q)]$ [6].
Where:
n= sample size,
Z= Statistics for the level of confidence at 95%, (Z value is 1.96)
P= Previous prevalence of 11.9% assumed prevalence of study conducted by Ruhembe *et al.* [8].
Q= (1-P),
e= acceptable error (precision at 5%), and
N= total population size
This resulted in a sample size of 146; the original sample size was multiplied by a design effect (D) of 1.56, which increased the sample size to 229 in order to achieve the sample precision due to variability within and between clusters [9].

Sampling procedure

Clusters were formed purposively per departments, which are Health, Education (primary and secondary), Administration and other departments and sections with few workers who were merged together, and then these clusters were stratified on gender. Then study subjects were sampled from each stratum by applying systematic random sampling technique, and units were selected with probability proportional to size.

Data collection

A questionnaire translated to Kiswahili was administered to respondents through face-to-face interview and information was entered in the Microsoft Excel (Appendix 3). The outcomes variable was presence of raised blood glucose above normal while explanatory variables were age, sex, smoking and alcohol consumption, type of occupation and years of education, history of first-degree, relative with diabetes, history of hypertension or being on treatment for hypertension, time and extent of physical activity by the workers as well as the extent of extra curricula and leisure.

Weight and height of the participants was measured and BMI was calculated and were ranked into four: 16.0-18.4 kg/m^2 as underweight, 18.5-24.9 kg/m^2 as normal weight, 25.0-29.9 kg/m^2 as overweight, and 30-49.9 kg/m^2 as obese (National Institutes of Health (NIH), 1998).

Blood pressure (BP) was measured and ranged into Normal BP ranges 90-119 Systolic and 60-79 Diastolic, pre-hypertension 120-139 Systolic and 80-89 Diastolic, Stage 1 hypertension 140-159 Systolic and 90-99 Diastolic, and Stage 2 hypertension 160-179+ Systolic and 100-109+ Diastolic [11, 12].

Random Blood Glucose (RBG) was measured by using a standardised *Gluco Plus* machine; using capillary finger prick method. Subject with RBG level between ≥ 5.6 and <11.1 mmol/l or (≥ 100 and <200 mg/dl) were given a follow-up measurement for fasting blood glucose (FBG).Participant with FBG value between 6.1 and 6.9 mmol/l or (110 and125 mg/dl) or above was registered as being at high risk of T2DM and a subject with value ≥7.1mmol/l was registered as having Diabetes Mellitus [13].

Data analysis

Multiple logistic regression was performed to examine the associations between the outcomes variable Type 2 Diabetes Mellitus and clinical and demographic explanatory variables. Explanatory variables were selected based on earlier research clinical reasoning and univariable logistic regression. Crude association of each explanatory variable was determined to examine its relationship with the outcome variable in univariable models. Upon completion of the univariable logistic analyses, variables were selected for the multivariable analyses. Any variable whose univariate test had a P-value<0.10 was considered a candidate for themulti variable model along with variables of known clinical importance. Once the variables were identified, they were entered into a multivariable model. The associations were presented as odds ratios (OR) with 95% Confidence Intervals (CI). A Hosmer and Lemeshow test were used to examine if the final model adequately fitted the data for the multiple logistic regression model. An interaction test between Sex, age, and history of diabetes was performed to examine heterogeneity effect. Dependent variables were coded as yes = 1 and no = 0. Categorical explanatory variables were coded depending on their level and the reference category was indicated. The final parsimonious model was presented (that is the model with significant findings for predictors). The model building procedure and the guidelines for reporting regression analysis have previously been described in detail elsewhere [14].

Ethics procedures

Ethical clearance certificate (No. NIMR/HQ/R.8a/Vol. IX/2084) was obtained from the Medical Research Coordinating Committee of the National Institute for Medical Research (NIMR) through the University Ethical Coordinating Committee. The permission was also obtained from Bariadi Town Council authorities. Before each subject was enrolled informed consent was signed, and confidentiality protocols were observed.

Results

Socio-demographic characteristics of participants

A total of 229 participants were sampled from five formed groups, namely; Primary education 133 (58.1%), Secondary education 43 (18.8%), health 36 (15.7%) and, Administration and others 17 (7.4%) (Table 1). Among these 123 (53.7%) were female and 106 (46.3%) were male. The age was grouped into four groups, years between 21-30 were 48 (21.0%), between 31-40 were 74 (32.3%), between 41-50 were 60 (26.2%) and between 51-60 were 47 (20.5%). The majority of the participants 109 (47.6%) had college education, 98 (42.8%) were graduates and 17 (7.4%) had postgraduate education; while five (2.2%) had primary education only.

Majority of the respondents 226 (98.7%) had not used any tobacco product, whereas three (1.3%) had used and were still using tobacco products. Regarding alcohol consumption, 78 (34.1%) of the respondents had taken alcohol before the interview, 71 (91%) among these were currently taking alcohol and 151 (65.9%) had never taken alcohol. About 5.2% (12) of the respondents had vigorous activities as well as vigorous exercise and more than 60% had moderate activities and moderate exercises.

About 173 (75.5%) have walked or pedalled for at least 10 minutes continuously to and from work on each working day whereas 56 (24.5%) used other means of transport to and from work.

Whereby 145 respondents (63.3%) spent around one to one and a half hours sitting, 56 (24.5%) spent one and a half to three and a half hours sitting, 19 (8.3%) spent three and a half to four and a half hours sitting; while 9 (3.9%) spent five to six hours sitting.

About 160 (69.9%) had checked their BP prior to the interview, 94 (41%) had second-degree relatives with raised BP; and, 50 (21.8%) had history of being told by a doctor or health worker to have raised BP in the past 12 months. For each participant, BP was also measured; For SBP 99 (43.2%) had raised SBP, 65 (28.4%) had normal SBP, 45 (19.7%) had moderately raised SBP and 20 (8.7%) had severely raised SBP. On DBP; 180 (79.0%) had normal DBP, 28 (12.2%) raised DBP, 15 (6.6%) moderately raised DBP and five (2.2%) had severe raised DBP and only seven (3.1%) had previous treatment of raised BP.

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Blood sugar; 92 (40.2%) have had their blood sugar checked previously, 65 (28.4%) had second-degree relatives with raised blood sugar, 18 (7.9%) were told to have raised blood sugar; but only three (1.3%) were on insulin or other oral anti-hyperglycaemic agent treatment. Among the participants, 158 (69.0%) had taken food before random glucose screening test and 18 (7.9%) were found to be diabetic and 211 (92.1%) non-diabetic.

Participants were also screened for fat deposition by measuring weight in kg and height in meter square and expressed as Body Mass Index (BMI kg/m^2); 80 (34.9%) were in normal range, 79 (34.5%) were overweight, 66 (28.8%) were obese, and 4 (1.7%) underweight.

Prevalence of type 2 diabetes mellitus

Overall prevalence of T2DM was found to be 7.9%. (95% CI=4.7-12.2%) as shown in (Table 2). The prevalence of T2DM was 9.8% for females and 5.7% for males. The age bracket between 51-60 years had the highest prevalence of T2DM 17.0%, followed by 41-50 years 8.3%. Prevalence was found to be the highest in participants working in primary education at 9.0% and the lowest in participants working in the administration and others categories at 5.9%. Additionally, participants with BMI between 30.0-49.9 kg/m^2 were found to be mostly affected at 21.7% and those with BMI between 25.0-29.9 kg/m^2 and 18.5-24.9 kg/m^2 had the least effect at 5.0%.

Bivariate association of type 2 diabetes mellitus to different variables

The factors significantly associated with T2DM among workers at Bariadi Town Council are given in Table 3. Participants aged between 51-60 years had 2.4 times the prevalence of those aged between 21-30 years (PR=2.47, CI: 0.69-8.81). In addition, participants with mean SBP between 160-179 mmHg had 4.5 times the prevalence of those with normal SBP (PR=4.53, CI: 1.17-17.59) and those with mean DPB between 90-99 mmHg had 3.3 times the prevalence of those with normal DBP (PR=3.37, CI:1.20-9.42). Besides, participants who had checked blood sugar had 2.7 times the prevalence those who had not checked their blood sugar (PR=2.75, CI: 1.07-7.09), and those with history of raised blood sugar had 6.8 times the prevalence of those without the history of raised blood sugar (PR=6.80, CI: 2.95-15.69). Again, a person with history of raised blood sugar in the family had 2.8 times the prevalence of those without family history (PR=2.87, CI: 1.18-6.98). Also, participants taking insulin or oral hyperglycaemic agent had 6 times the prevalence of those not taking insulin or oral hyperglycaemic agent (PR=6.05, CI:1.87-19.56). Furthermore, participants with BMI ranging 30.0-49.9 kg/m^2 had 2.7 times the prevalence of those ranging with BMI between 18.5-24.9 kg/m^2 (PR=2.76, CI: 0.90-8.45). However, female participants, aged between 41-50 years and below, mean SBP between 140-159 mmHg, 120-139 mmHg, mean DBP between 80-89 mmHg and BMI ranging 25.0 -29.9 kg/m^2 were not statistically significant.

Risk factor analysis by multivariate logistic regression for T2DM

From the logistic regression procedure, five variables formed the final model. These are sex, age, years of education, time spent sitting and history of raised blood sugar (Table 4). The odds of developing T2DM were 4 times higher for female subjects compared to male subjects; the difference was statistically significant (OR=4.6, CI: 1.069-19.325). The odds of developing T2DM were 8 times higher for subjects aged between 30-41 years and the odds of developing of T2DM were 15 times higher for subject aged 41-50 years compared to subject aged 21-30 years; these were statistically significant (OR=8.080, CI: 1.215-53.741; OR=15.080, CI: 2.315-98.342).

Subjects with no history of raised blood sugar had reduced odds for developing T2DM (OR=0.032, CI: 0.006-0.167) compared to those with the history of raised blood sugar. The results were statistically significant given that the 95% CI did not bracket the null value. The odds of developing T2DM were 3 times higher for subjects aged between 51-60 years compared to subjects aged 21-30 years. However, the OR was not statistically significant (OR=3.673, CI: 0.805-16.548). Years of education and time spent sitting were not statistically associated with the development of T2DM in this study. There were no significant interactions from the regression procedure (Table 4). The multivariate regression model fitted the variables well as shown by Hosmer-Lemeshow test (x^2=1.881, df = 8 and p-value of 0.984).

Discussion

An overall prevalence of T2DM in this study was found to be 7.9%, slightly lower than the national prevalence of 8.0% as reported in 2012 [2]. A recent study by Ruhembe *et al*. [8] conducted in Mwanza urban reported higher prevalence of 11.9% and observed that, public education on diet-related diseases should be emphasised and routine check-up of blood glucose levels be undertaken among adults.

A study conducted by Prem-Kumar *et al.* [15] on the prevalence of T2DM and its associated factors among public university staff in Selangor, Malaysia revealed a bit higher prevalence of 12.8%. This was associated with age, gender, physical inactivity, smoking status, alcohol consumption, obesity, history of hypertension and hyperlipidaemia.

Much higher prevalence was reported in a study conducted in South Africa among the mixed ancestry population of the Western Cape where the prevalence of T2DM was as higher as 28.2% [16]. This was thought to be attributed by high socio-economic status, differences in obesity and geographical location of the population.

In our study, prevalence was found to be higher among workers in primary schools than those workers in other departments. This could be attributed by the level of education and working environment. Most of them had secondary education and acquired certificate of teaching; they fall short of basic health principles for disease prevention. In connection to that, their earnings may not enable them to pay for medical services and they solely depend on the government health facilities which are not constantly available and accessible.

A recent study show that, the lower education level is associated with the high prevalence of T2DM in men and women in western European countries; even though it does not have a direct biological effect on disease, its effects are mediated by other risk factors that are biologically related to disease such as smoking, high BMI and physical inactivity [17]. Similar results by Ross *et al.* [18] reveal that there is association between educational level and T2DM incidence, which have more evident to female with low education than male counterpart.

Conclusively, studies have shown that the existence of socio-economic inequalities have a role in the epidemiology of T2DM. A person living in residential areas with no access to necessary needs, having lower education, lower income and employment grades has an increased prevalence of T2DM and other chronic illnesses [19, 20].

The study found out that, advancing in age had significant association with the development of T2DM. This could be explained that, as an individual advance in age tends to change lifestyle behaviour, including physical activity, eating habits as well as physiological changes, such as increased tendency of fat deposition. A recent study affirms that, there is a strong association between the development of T2DM and advance in age; this was found to be influenced by reduced lean mass, physical inactivity and impairment in carbohydrate intolerance [21, 22]. Ruhembe *et al*. [8] also observe that, diabetes tends to increase with age between 41-60 years and decrease at the age of over 60 years for both men and women; and advanced age poses a triple risk of developing T2DM as compared to young age and that, worsening glycaemic status was associated with increasing age, smoking and eating behaviour.

Moreover, a study conducted by Peer *et al.*[4] show that, in Africa the prevalence of T2DM was 4.9%; the majority with diabetes being below 60 years old, the highest proportion 43.2% in the age of 40-59 years, and the situation could be attributed by economic development in Africa and increased in life-expectancy. Global data show that, the largest proportion of people with T2DM are between 40-59 years [23]; for developed countries the majority are aged over 60 years, whereas for developing countries most people are of working age, between 40 to 60 years [24].

The results in this study also revealed that women had significant higher risk of developing T2DM than men. This could be explained by the lifestyle of women workers in urban setting; most of them do not take enough time walking or pedalling, instead they use vehicles and motorcycle going and coming back from work. They also, do not attend to household chores regularly instead; housemaids undertake most of the work at home while they remain sitting watching movies and television. The World Health Organization reports that, across the world women are less active than men, with 27% of women and 20% of men classified as insufficiently physically active; adding that, physical

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inactivity is alarmingly common among adolescent girls by 84% and 78% of boys not meeting minimum requirements for physical activity [25].Contrary to our findings, studies show that, men had a greater risk for developing T2DM than women [26]. This could be due to the effects of testosterone and oestradiol hormones on storage of fat around the abdominal tissues and of insulin resistance on men [27, 28].

The study revealed that previous history of raised blood sugar had significant association with developing T2DM. This may be explained that, most of the respondents had been told to have had raised blood sugar by health service providers but did not seek medical care. A study conducted in Uganda highlights that, the previous history of raised blood sugar had strong association with glucose intolerance and consequently the development of overt T2DM [29]. Likewise, Safari *et al.* [30] report that, an individual with previous history of raised blood sugar is more likely to develop T2DM at later life. Nathan *et al.*[31] show that, transition from the early metabolic abnormalities that precede diabetes, impaired fasting glucose (IFG) and impaired glucose tolerance (IGT), to diabetes takes many years; however, 60% of these individuals with pre-diabetic status eventually develop diabetes. Furthermore, studies provide evidence that, changes in lifestyles of both women and men at risk for the T2DM can prevent the disease by 58% [32].

In this study, it was found out that, years spent in education had no significant association with the development of T2DM, despite the attributes played by stressful experiences or events during studies and after school, such as missing meal, financial constraints and loads of study materials and examination. This is relevant to several literatures showing that, an individual who have no access to some studies have higher prevalence of T2DM in urban areas than rural areas in developing societies [33, 34]. However, recent studies provide evidence that lower educational level is associated with a higher risk of T2DM in men and women in Western European countries [35]. Similar contention shows that, education level is a poor surrogate for general literacy skills and for health literacy; education level only measures the number of years an individual attended school, not how much the individual learned in school [36].

However; contrary to findings of this study, several studies attribute the development of T2DM to person who had many years in school with dietary habits and breakfast eating behaviour. Breakfast skipping has been reported to be a potential cause of T2DM, due to having higher after-lunch postprandial glucose and insulin level, which eventually leads to impaired postprandial insulin sensitivity [37, 38].

Our study found out that, longer time spent sitting or reclining have no association with the development of T2DM. Despite that workers in urban settings performs most of their duty while sitting and hardly moved; after work hours went back home driving and again sat down watching movies and television for quite long period, which could lead to energy intake and energy expenditure imbalance resulting to overweight and obesity and eventually to relative insulin resistance and T2DM.

This finding is consistent with the study conducted in Uganda showing that, physical inactivity has significant association with the development of T2DM [29]. Similar findings by Fritschi *et al.*[38] suggest that the total amount of time spent sedentarily is associated with higher blood glucose levels, even when adjusted for time spent in light physical activity, gender, and BMI. Wilmot *et al.*[39] affirmed that, sedentary time is associated with an increased risk of diabetes, cardiovascular disease and all-cause mortality; the strength of the association is most consistent for diabetes. Also, a suggestion by the United Kingdom government stresses that, all adults should minimise the amount of time spent sitting sedentarily for extended periods and should be active for at least 150 minutes of moderate intensity activity per week [40].

Limitation of this study should be considered that; the cross-sectional design of this study prohibited the study from concluding causal relationships between identified risk factors and the development of T2DM. In addition, the study did not investigate the relationships between genetics and T2DM, which could establish the relationships between first-degree relatives with diabetes mellitus and the development of T2DM.

Conclusions

An overall prevalence of T2DM in this study was found to be high and female having higher than male. Factors associated with T2DM were sex, age and history of raised blood sugar.

It is recommended that, the Local Government Authority through their council health facilities should plan for a sustainable intervention programme that will undertake screening for workers.

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Table 1. Socio-demographic Characteristics of the study Participants

Variables	Category	Frequency	Percent
Department	Health	36	15.7
	Sec. Edu	43	18.8
	Prim. Edu	133	58.1
	Admin_others	17	7.4
Sex	Male	106	46.3
	Female	123	53.7
Age	21-30	48	21.0
	31-40	74	32.3
	41-50	60	26.2
	51-60	47	20.5
Years of Education	1-7	5	2.2
	8-13	109	47.6
	14-17	98	42.8
	18-24	17	7.4
Ever Smoked	Yes	3	1.3
	No	226	98.7
Current Smoker	Yes	3	1.3
	No	226	98.7
Ever Drink Alcohol	Yes	78	34.1
	No	151	65.9
Currently Drink Alcohol	Yes	71	31.0
	No	158	69.0
Vigorous Activities	Yes	12	5.2
	No	217	94.8
Moderate Activities	Yes	141	61.6
	No	88	38.4
Walking or Pedalling	Yes	173	75.5
	No	56	24.5
Vigorous Exercise	Yes	13	5.7
	No	216	94.3
Moderate Exercise	Yes	65	28.4
	No	164	71.6
Time Spent Sitting (minute)	0-90	145	63.3
	91-180	56	24.5
	181-270	19	8.3
	271-360	9	3.9
Ever Checked BP	Yes	160	69.9
	No	69	30.1
History of raised BP	Yes	50	21.8
	No	179	78.2
Person with raised BP	Yes	94	41.0
	No	135	59.0
Mean SBP	90-119	65	28.4

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	120-139	99	43.2
	140-159	45	19.7
	160-179+	20	8.7
Mean DBP	60-79	181	79.0
	80-89	28	12.2
	90-99	15	6.6
	100-109+	5	2.2
Ever Checked Blood Sugar	Yes	92	40.2
	No	137	59.8
History of Raised Blood Sugar	Yes	18	7.9
	No	211	92.1
Person_ Blood sugar	Yes	65	28.4
	No	164	71.6
Body Mass Index (BMI Kg/m^2)	16-18.4	4	1.7
	18.5-24.9	80	34.9
	25.0-29.9	79	34.5
	30.0-40.9+	66	28.8

Table 2. Prevalence of DMT2 among different categories of participants

Variables	**Category**	**n***	**n+ve****	**Prevalence (%)**	**95% CI**
Department	Health	36	2	5.6	0.7-18.7
	Sec. Education	43	3	6.9	1.5-19.1
	Pri. Education	133	12	9.0	4.7-15.2
	Admin_others	17	1	5.9	0.1-28.7
Sex	Male	106	6	5.7	2.1-11.9
	Female	123	12	9.8	5.1-16.4
Age	21-30	48	3	6.3	1.3-17.2
	31-40	74	2	2.7	0.3-9.4
	41-50	60	5	8.3	2.8-18.4
	51-60	47	8	17.0	7.6-30.8
BMI kg/m^2	16-18.4	4	0	0.0	0.0-60.2
	18.5-24.9	80	4	5.0	1.4-12.3
	25.0-29.9	79	4	5.06	1.4-12.5
	30.0-49.9	46	10	21.7	10.7-36.4
Diabetic	All	229	18	7.9	4.7-12.1

Conventions
n*=Number of participants in each category
n**=Number of positives in each category

Table 3. Prevalence ratio of T2DM for different risk factors

Variable (s)	**Category**	**n***	**n(+ve) ****	**Prevalence Ratio (PR) [95% CI]**	**P-value**
Sex	Male	106	6	1	
	Female	123	12	1.66 [0.64-4.28]	0.151
Age in Years	21-30	48	3	1	
	31-40	74	2	0.45 [0.08-2.58]	0.201
	41-50	60	5	1.31 [0.33-5.22]	0.365
	51-60	47	8	2.47 [0.69-8.81]	0.080
Treated BP within 2 weeks	Yes	7	2	1	
	No	122	16	1.92 [0.52-7.08]	0.192
Mean SBP	90-119	65	3	1	

	120-139	99	7	1.49 [0.40-5.59]	0.288
	140-159	45	3	1.42 [0.29-6.72]	0.338
	160-179+	20	5	4.53 [1.17-17.59]	0.017*
Mean DBP	60-79	180	12	1	
	80-89	28	2	1.07 [0.25-4.53]	0.439
	90-99	15	4	3.37 [1.20-9.42]	0.025*
	100-109+	5	0		
Checked blood sugar	Yes	92	12	2.75 [1.07-7.09]	0.017*
	No	137	6	1	
History of raised blood sugar	Yes	18	8	6.80 [2.95-15.69]	0.000*
	No	211	10	1	
Person_raised blood sugar	Yes	65	10	2.87 [1.18-6.98]	0.011*
	No	164	8	1	
Insulin/OHA	Yes	3	2	6.05 [1.87-19.56]	0.023*
	No	226	16	1	
BMI (kg/m^2)	16-18.4	4	0		
	18.5-24.9	80	4	1	
	25.0-29.9	79	4	1.01 [0.26-3.91]	0.493
	30.0-49.9	66	10	2.76 [0.90-8.45]	0.035*

Convention

n*=Number of participants in each category
n**=Number of positives in each category
*=Statistically significant results ($p<0.05$)

Table 4. Logistic regression model results for T2DM

Variables	**Category**	**N***	**n (+ve %) ****	**Odds Ratio**	**95% CI**	**Variables**
Sex	M	106	6 (5.7)			
	F	123	12 (8.9)	4.545	1.069	19.325
Age (Years)	21-30	48	3 (6.25)			
	30-41	74	2 (2.7)	8.080	1.215	53.741
	41-50	60	5 (8.3)	15.080	2.315	98.342
	51-60	47	8 (17.0)	3.673	0.805	16.548
Years of Education	1-7	5	0 (0.0)			
	8-13	109	6 (5.5)	724374200	0.000	-
	14-17	98	11(12.2)	0.345	0.019	6.406*
	18-24	17	1 (6.9)	0.103	0.006	1.829*
Time Sitting	0-90	145	14 (9.6)			
	91-180	56	3 (5.3)	0.000	0.000	-
	181-270	19	1 (5.3)	0.000	0.000	-
	271-360	9	0 (0.0)	0.000	0.000	
History raised Blood sugar	YES	18	18 (100)			
	NO	211	10 (4.7)	0.032	0.006	-

Conventions

n*=Number of participants in each Category
n**=Number and percentage positives in each Category
*=Not statistically significant