Prevalence of T2 Diabetes Mellitus (DM) Among the Rural People of Selected villages Of Bangladesh

Ali MY[1], Begum M[2], Dipu SS[3]

Abstract

Objectives : This cross –sectional study was conducted to find out the prevalence of type 2 diabetes and pre-diabetes [(PD) (Impaired fasting glucose-IFG, impaired glucose tolerance-IGT)] and to see the associations with risk factors.

Methods : Two villages were randomly selected from rural area of Mymensingh district. 125 study subjects (≥ 30 years) were selected with systematic procedure but 118 samples were participated in the study. Below 30 years, diagnosed case of diabetes and urban people were excluded from study. Socio-demographic data were collected on a pre-tested interview schedule through face to face interview. DM, PD were interpreted by estimating fasting blood glucose level and 2 hour after 75 gm glucose load. Obesity was assigned by BMI. SPSS program (version 11.5) used for data analysis.

Results : Mean age of participants was 46.68 with SD $\pm$ 12.698. Female participation (66.9%) was double compare to male. literacy rate was (64.4%) with female illiteracy of 29.67%. House wives (61.9%) were more than other professions. Middle class people were nearly 73%. Poor 14.4%, sedentary life style 11% and depressives 14.4% evident in study. A 20.3% people did laborious works. 17.8% had the family history of diabetes. Smokers (53.4%) were more than the non-smokers. Majority (89.0%) of rural people eat rice thrice a day. Normal BMI 61.0%, underweight 31.4% and 7.6% overweight observed.

Overall prevalence of T2 DM was 11.0% showing increase trend of diabetes compared to 8.6% estimated in 2000 and higher than several studies of home and abroad. Female showed higher prevalence (7.6%) compare to male (P>0.05). The overall prevalence of PD was 16.1% evident in this study. The prevalence of IFG and IGT were 8.5% and 7.6% respectively. Female showed higher prevalence of IFG (5.1%) and IGT (5.9%) than male (P>0.05). House wives showed higher prevalence (5.6%) of DM compare to other professions (P> 0.05). Illiterates showed more PD (10.3%) and less DM (1.7%) but literates showed more (9.3%) DM (p >0.05). DM (6.7%) and PD (11.8%) more were among the middle class (P=0.018). A high prevalence of PD (13.6%) and DM (9.3%) noticed among non-sedentary lifestyle (P >0.05). smoker showed higher DM (8.5%) and PD (11.8%), (P=0.071). Prevalence of PD and DM were high among the people with physically less active (P =0.795). Depressives showed more prevalence of DM (8.5%) and PD (13.5%), (P=0.345). increased frequency of rice eating (P=0.004), people with normal BMI (P=0.081) and family history of DM (P=0.000) showed positive association with diabetes mellitus.

Key words: Prevalence of T2 DM, Rural people.

Introduction

Diabetes Mellitus (DM) is a clinical syndrome characterized by hyperglycemia due to absolute or relative deficiency of insulin[1].It may be due to autoimmune Type1 (T1) diabetes or to adult-onset Type 2 (T2) diabetes. Pandemicity of diabetes principally involved type 2 diabetes associated with greater longevity, obesity, unsatisfactory diet, sedentary life style and increasing urbanization. Type 2 diabetes is an ice-berg of

1. * Dr. Md. Yunus Ali
    Associate Professor of Community Medicine
    Community Based Medical College Bangladesh

2. Dr. Maksuda Begum
    Assistant Professor of Community Medicine
    Community Based Medical College Bangladesh

3. Dr. Sultan Sobnam Dipu
    Assistant Professor of Community Medicine
    Community Based Medical College Bangladesh

*Address of correspondence
Email : yunusalibd62@yahoo.com
Mobile: 017113 5742

disease. Lack of insulin affects the metabolism of carbohydrate, protein and fat and can cause a significant disturbance of water and electrolyte homeostasis. Death may result from acute metabolic decompensation. It is estimated that in the year 2000,171 million people had diabetes mellitus and it is expected to double by the year 2030[2]. Although the prevalence of both type-1 and type 2 DM is increasing worldwide, the prevalence of type2 DM is predicted to rise more rapidly in the future because of increasing obesity and reduced activity level. DM increases with aging. In the year 2000, the prevalence of DM was estimated to be 0.19% in people less than 20 years old and 8.6% in people over 20 years of age. In individuals more than 65 years old, the prevalence of DM was 20.1%. The prevalence is similar in man and women throughout most age ranges but are slightly greater in man over 60 years of age[3]. More than 85% of diabetes patient in the world have T2 diabetes. Magnitude of diabetes mellitus in Bangladesh is increasing. In mid 60s the prevalence rate was around 1.5%, which has increased to more than 15% in recent years[3].

DM was found 4.9% among adult in rural area of Bangladesh[4]. In the year 2000, Bangladesh had 3.2 million people with diabetes and was listed at 10, which will occupy the 7th position among the countries of the world, with 11.1 million in 2030. Diabetes registry in the referral centers and diabetes survey at the community level reflects the rapid increase of diabetes prevalence in the country. Small diabetes surveys, at community level at different time point proved an increasing prevalence of diabetes and impaired glucose tolerance[5]. In 2010, The International Diabetes Federation (IDF) estimated that 5.7 million (6.1%) and 6.7 million (7.1%) people living in Bangladesh is suffering from DM and Impaired glucose tolerance (IGT) respectively[6]. Prevalence of DM found 7.2% and impaired glucose regulation 6.5% in a study in Bangladesh[7]. Population based studies conducted in Bangladesh at different time points revealed an increasing trend of diabetes prevalence in both rural and urban communities[8-13]

Objective of the study: To find out the prevalence of type 2 DM and prediabetes among the adult people in rural community and it's association with different risk factors,

Operational definitions :

Illiterate: people those who are unable to read or write.

Literate: people those who can read and write.

Poor: people having no cultivating land but have their own living cottage or not. They have to do labour works for earning to maintain their family expenditure.

Middle class: people have their own cultivating land or low quality job and own living house. They have not to do lobourer works. They can maintain annual family expenditure from the production of their own land or from job salary.

Rich: They have sufficient own cultivating land or business or a high official job and own standard living house. After maintaining annual expenditure of the family, they can deposit an amount of money in a bank account.

Smoker: the person who smokes more than 3 sticks of cigarettes in 24 hours.

Methods
A list of sample frame of 650 was made from the selected rural population. All adult male female of village Babkhali and pongagra were the study population. People aged 30 years and above, irrespective of religion, cast and without social stratification included in the study. Age below 30 years, urban people, and diagnosed cases were excluded. Study period was July2014 to November 2014 and conducted in Community Medicine department of CBMCB. First sample was selected purposively; there after 125 samples were selected with systematic sampling procedure of sample interval of 5. A pre-tested interview schedule which included variables regarding

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the age, sex, religion, educational status, occupation, economic status, lifestyle, physical activity, smoking habit, obesity, depression, family history of diabetes, DM, IFG and IGT.

A wall mounted height measurement tape for measuring height, a modern bathroom scale for measuring the weight, a glucometer (made in Taiwan) with stripes for glucose level measurement were data collection instruments. Socio-demographic information was collected from individual study subject through face to face interview regarding his/her age, religion, marital status, education, occupation, economic status, lifestyle, food habit, smoking habit, physical activity, family history of diabetes. Weight was taken in kg with light cloths and without wearing shoes by a digital bathroom scale placed on a flat surface. A measuring tape was fixed vertically on a flat wall to take the height of the participants. A movable headboard with vertical dimension to ensure stability of the measuring wall was contact with the topmost point of the head with sufficient pressure to compress the hair and height was taken to the nearest centimeter. Height was measured without shoes, standing in erect on a flat surface. Heels, buttocks and shoulders were flat on the measuring wall which was straight and the study subject looked straight ahead (a line between the angle of eye and the upper point of attachment of ear be horizontal). BMI was interpreted after measuring the weight and height of the sample unit. Body mass index was calculated as weight in kg / height in meterssquare. Fasting blood glucose, capillary blood glucose level after 2 hours of 75 gram glucose load, were estimated for interpretation of diabetes mellitus and other abnormalities of glucose conditions. Data were plotted accordingly on the interview schedule. Data analysis was done through SPSS program (version 11.5) after entry into a computer. The prevalence of diabetes and pre-diabetes were expressed as percent.

Table I: Socio-demographic characteristics of sample population. n = 118

Age group	Sex of respondents		Total
	Male	Female	
30-40	15	29	44
40-50	08	27	35
50-60	10	19	29
60 and above	06	04	10
Total	39 (33.10%)	79 (66.90%)	118 , 100%
Mean age	46.79 years	44.75	Pvalue:0.174
Education			
Illiterate	7	35	42, 35.6%
Literate	32	44	76, 64.4%
Total	39	79	118, pvalue:0.005
Occupation			
Agriculture	15	00	15(12.7%)
Business	03	00	03(2.5%)
Service	15	05	20(16.9%)
House wife	00	73	73(61.9%)
Others	06	01	07(5.9%)
Total	39	79	118, pvalue:0.000
Economic status			
Poor	02	13	15(12.6%)
Middle class	32	54	86(72.9%)
Rich	05	12	17(14.4%)
Total	39	79	118, Pvalue:0.182

Table II: Lifestyle with family history of diabetes of the respondents.

Life style	Number of respondents		Total
	Yes	No	
Sedentary life	14(11.9%)	104	118
Laborious work	24(20.3%)	94(79.7%)	118
Smoking habit	63(53.4%)	55(46.6%)	118
Depression life	17(14.4%)	101(85.6%)	118
Family history of diabetes	21(17.8%)	97(82.2%)	118

Table III: Distribution of respondents according to the rice eating and BMI.

Rice eating habit	3 times a day	2 times a day	One time	Total
	105(89.0%)	12(10.2%)	01(0.8%)	118
Body mass index	Underweight	Normal	Overweight	
	37(31.4%)	72 (61.0%)	09(7.6%)	118

Table IV: Distribution of sample population according to the clinical variables (IFG, IGT and DM). n= 118

		frequency	IFG	IGT	DM
Sex	Male	39	4, (3.4%)	2 (1.7%)	4 (3.4%)
	Female	79	6 (5.1%)	7 (5.9%)	9 (7.6%)
Religion					
	Non-Muslim	01	0,0%	0,0%	0, 0%
	Muslim	117	10 (8.5%)	09 (7.6%)	13 (11.0%)
Occupation					
	Agriculture	15	02 (1.7%)	01	2 (1.7%)
	business	03	00	00	0, 0%
	Service	20	02 (1.7%)	02	4 (3.4%)
	House wife	73	6 (5.1%)	6, (4.2%)	7 (5.6%)
	others	07	0, 0%	0, 0%	0, 0%
Education					
	Illiterate	42	7 (5.9%)	4 (3.4%)	2 (1.7%)
	Literate	76	3, (2.5%)	5 (4.2%)	11 (9.3%)
Economic status					
	Poor	15	2 (1.7%)	0,0%	0,0%
	Middle class	86	7(5.9%)	7(5.9%)	8(6.8%)
	Rich	17	1(0.8%)	2(1.7%)	5(4.2%)
Sedentary life					
	no	104	8(6.8%)	8(6.8%)	11(9.3%)
	yes	14	2(1.7%)	1(0.8%)	2(1.7%)
Smoking					
	no	55	3(2.5%)	2(1.7%)	3(2.5%)
	yes	63	7(5.9%)	7(5.9%)	10(8.5%)
Hard work					
	no	94	9(7.6%)	7(5.9%)	10(8.5%)
	yes	24	1(0.8%)	2(1.7%)	3(2.5%)
depression					
	no	101	10(8.5%)	8(6.8%)	10(8.5%)
	yes	17	0.0%	1(0.8%)	3(2.5%)
Rice eating					
	3 times a day	105 (88.89%)	9(7.6%)	8(6.8%)	9(7.6%)
	2 times	12	1(0.8%)	1(0.8%)	3(2.5%)
	One times	01	0, 0%	0,0%	1(0.8%)
BMI					
	underweight	37	2(1.7%)	0.0%	3(2.5%)
	normal	72	7(5.9%)	8(6.8%)	7(5.9%)
	Overweight	09	1(0.8%)	1(0.8%)	3(2.5%)
Total		118	10, 8.5%	09,7.6%	13,11.0%

Table V: Statistical test of Association between Variables.

Diabetes VS	Chi-square value	Df	P value	Remarks on Relation of Variables
Sex	0.34	1	0.853	Insignificant
Occupation	3.11	4	0.538	Insignificant
Education	2.6	1	0.107	Insignificant
Economic status	7.98	2	0.018	Significant
Body Mass Index	5.015	2	0.081	Insignificant
Smoking	3.25	1	0.071	Insignificant
Sedentary life	0.173	1	0.677	Insignificant
Depression	0.891	1	0.345	Insignificant
Laborious work	0.068	1	0.795	Insignificant
Rice eating habit	11.11	2	0.004	Significant
Family history of Diabetes	12.97	1	0.000	Significant

Results

Table I- shows, females were almost double (66.9%) than male (33.1%). Mean age was 46.79 years in male and 44.75 years in female respectively. Muslims were nearly 100% (99.2%). Female illiteracy (29.67%) was more than male. Literates were 76(64.4%). Maximum percent 73(61.9%) was house wife, 20 (16.9%) were service holder, 15 (12.7%) were agriculture in profession. Business men were very negligible 03(2.5%); other professions was 07(5.9%). Middle class peoples were 86(72.9%) highest percent. Rich and poor were 17(14.4%) and 15(12.7%) respectively.

Table II- 11.9% respondent was leading sedentary life and 24(20.3%) did laborious works. Smokers (53.4%) were more than non-smokers (46.6%). 14.4% respondents was depressive and 17.8% had family history of diabetes.

Table III- Shows, increased frequency (3 times a day) of rice eating found 105(89.0%) followed by 2 times 10.2% and one time 0.8%.Underweight was 31.4% and 72(61.0%) were in normal BMI and overweight/obese was 7.6%.

Table IV. The prevalence of DM, IFG and IGT were evident 13(11.0%), 10(8.5%) and 09(7.6%) respectively. In female, more

prevalence of IFG 6(5.1%), IGT 7(5.9%) and DM 9(7.6%) were evident than male. More prevalence of DM 7(5.6%) found among the housewives. Among the service holder it was 4(3.4%) and less DM 2(1.7%) evident in agriculture profession. Other professionals showed no evident of DM. More prevalence of IGT 5(4.2%) and DM 11(9.3%) among the literates than illiterates but IFG 7(5.9%) was more evident among the illiterates. Among the poor, there's no evident of IGT and DM. Among the middle class, both DM (6.8%) and pre-diabetes (IFG-5.9%,IGT 5.9%) were high in comparison to rich people (in rich DM 4.2%,IFG 0.8%,IGT 1.7%). Non-sedentary people showed higher prevalence of IFG 8(6.8%), IGT 8(6.8%) and DM 11(9.3%) than sedentary lifestyle people (among sedentary people (IFG 1.7%, IGT 0.8% and DM 1.7%).

Among the smoker higher prevalence of IFG(5.9%), IGT (5.9%) and DM (8.5%) were evident than non-smoker. A high prevalence of IFG (7.6%), IGT (5.9%) and DM (8.5%) found among the people who did not do labourious works. Non-depressives showed higher prevalence of IFG (8.5%), IGT (6.8%) and DM (8.5%) than depressives. A high prevalence of IFG (7.6%) and DM (2.5%) evident among the people who eat rice 3 times a day than those who eat less than 3 times. Less diabetes and pre-diabetes [IFG 2(1.7%), IGT 00% and DM 3(2.5%)] found in underweight subjects. Diabetes (2.5%) and pre-diabetes (1.6%) was also less among the overweight subjects. IFG 7(5.9%), IGT 8(6.8%) and DM 7(5.9%) were more in normal BMI subjects evident in this study.

Table V-More female participation and higher prevalence of diabetes noticed among the female population but statistically was insignificant (P =0.853). Female population was predominate than other professions but showed insignificant between occupation and diabetes (P =0.538). no association evident in between education and diabetes mellitus (P= 0.107). A statistical significant was found in between economic status and diabetes mellitus (P=0.018). Overweight assigned by BMI showed insignificant (P=0.081). More

prevalence found among the smoker but statistically no association was evident in between smoking and diabetes (P=0.071). More DM evident among people did not do laborious works (P=0.795) than people did laborious works. Sedentary lifestyle and depression also showed no association with diabetes mellitus. Increase frequency of rice eating (P= 0.004) and family history of diabetes significantly associated with diabetes mellitus (P =0.000).

Discussion

It was observed that female participation was double as compared to male which corresponds to the study of Md. Mafuzar and others[17]. Lesser participation of male because of engagement of male in agricultural and other daily home works. Participants age was 30 and above years with mean age 46.68 with SD ± 12.698. Literacy rate was 64.4% which is higher than the average rate (43.5%) of Mymensingh district (BBS-2011). Illiteracy rate was 35.6% of which female illiteracy rate (29.67%) was more than male. This is usual picture of rural population till now. Among the villagers middle class were more (72.9%) than the rich. Poor was less (14.4%) because of the socio economic improvement of people due to easy and more earn facilities available in all levels in the society. Overall prevalence of diabetes was 11.0% among the rural populations which showing increase trend of diabetes mellitus compared to 8.6% estimate in 2000. This prevalence co-relates with the recent study conducted in Pakistan(11.1%)[18,27], in India (11.6%)[28] and less than the data cited in Diabetes Mellitus-Certificate Course on diabetology[3] and is much more than the several studies[4,6,15,16]. The Prevalence of impaired Fasting Glucose (IFG) was 10(8.5%) evident in this study which is much lower than the study in US[20] and Nigerian[23]population but higher than the study conducted in US on 1997[22]. IGT was 7.6% evident, which is lower than the studies of India[21] and Nigeria[23]. The overall prevalence of pre-diabetes was 16.1% evident in this study which is less than (22.4%) the study of Shamima Akter and her colleaques[14]. IGT is

higher than the International Diabetes Federation (IDF) report[6] and the study of Shamima Akter[14]. Prevalence of DM and IGT were much higher than the study conducted in Bangladesh[7]. Higher prevalence of diabetes (7.9%) was found in female compare to male (3.4%, Tab.-V). This finding was lower than the findings of study conducted in urbanizing rural Bangladesh[17]. Higher prevalence of IFG (5.1%) and IGT (5.9%) evident in female compare to male which was higher than Indian study[19].More diabetes (5.6%, Tab V) was found among the house wives probably due to large number of female participation, they lead lazy life and do less physical activities due to advancement of mechanization in household works. More Prevalence of DM (7.6%) was evident among the female compare to male (3.4%) but statistically insignificant (P> 0.05). It co-relates with the study of Kashmir[21] but not co-relates with the urbanizing rural community study[17].

Prevalence of IFG (5.1%) was higher in female population than the male but was statistically insignificant (P> 0.05) and does not co-relate with the study of O.E Enanget al[23]. This higher prevalence of IFG is an emerging threat for developing diabetes among rural people in coming decade. Prevalence of diabetes (5.9%) was more among the house wives compare to service holder, agriculture and others professions but was statistically insignificant (P >0.05).In illiterates, more IFG and IGT were evident but diabetes (1.7%) was less. This was probably; they (illiterates) did more physical activities in daily life. In literates, less IFG, IGT but more diabetes (9.3%) was evident compare to illiterates (1.7%). This was due to less physical inactivity, change of lifestyle and food habit of literates. Statistically it was insignificant (P=0.107) and it co-relates with the study of Shamima Akter and her colleaques[14]. Among the poor, no evident of DM and IGT but less percent of IFG was noticed. It was probably they (poor) did more physical activities and they consumed low calorie diet. IFG, IGT were negligible but considerable percent of diabetes (4.2%) was

evident in rich people in this study and this was due to fewer amounts of rich people participated in the study. More diabetes mellitus (6.8%) was evident in middle class people compare to rich people (4.2%). Difference was statistically significant ((P < 0.05). More diabetes and pre-diabetes found in middle class people compare to rich and difference was statistically significant (P =0.018) and it was co-relates with study of Shamima Akter and her colleaques[14]. Less percent (20.3%) of people did laborious works evident in this study. This is probably due to modernization, mechanization, western style and also availability of sky culture in rural communities. Prevalence of IFG, IGT and DM (8.5%) were high among the people who did not perform laborious works than that of people did laborious works. Statistically, difference was insignificant (P =0.795) but the result was co-related with Singapore study[25].

A noticeable number of people (31.4%) were underweight probably less intake, less availability or lack of knowledge about nutrition. A good number (61.0%) of people with normal BMI and minimum percent of Overweight /obese found in this study probably they did regular daily house hold works and took less fatty or fast food diet. Obesity is an established risk factor for T2 diabetes. In our study it was revealed that more prevalence of pre-diabetes and diabetes (5.9%) was evident among the people with normal BMI compare to overweight/obese. Statistically it was insignificant (P>0.05). It does not co-relate with the several studies[14,17,29]. Lower prevalence of DM among overweight probably due to fewer number of obese subjects participated in the study. More than 14% people found to be depressive; actual cause was unknown. High percent of diabetes (8.5%) and pre-diabetes (IFG-7.6%, IGT-5.9%) noticed among the depressives compare to non-depressives. Though sedentary lifestyle is a risk factor of DM and pre-diabetes; unlikely a high prevalence (9.3%) of DM and pre-diabetes (IFG,IGT 6.8% each) noticed among non-sedentary subjects compare to the prevalence (1.7%) of

sedentary lifestyle subjects. Difference was statistically insignificant (P>0.05). It does not co-relate with study of HAM Nazmul Ahsan and his colleaques[15].Rural tradition is to eat rice more frequently. People who eat rice 3 times a day had high prevalence of DM (7.6%), IFG (7.6%), and IGT (6.8%) compare to people eat rice two or less times. A statistical significant was evident in between frequency of rice (carbohydrate) eating and diabetes mellitus (P < 0.01). This is new information that increase frequency of rice eating causes diabetes, needs further study to establish it. Smokers were more than non-smokers as the people were habituated to smoke from childhood and much more availabilities of biri, cigarettes and tobacco leaf. Smoker showed higher prevalence of diabetes (8.5%) and pre-diabetes (5.9%) compare to non-smoker (2.5%) but statistically insignificant (P > 0.05) and it does not co-relate with Singapore study[25].It is established that the people with family history of diabetes much prone to develop diabetes mellitus. Prevalence of DM noticed 5.9% among the people who had the family history of diabetes. A strong statistical association was evident in between family history of diabetes and the diabetic patients (P < 0.001); it co-relates with the Singapore study[25] and the study conducted Ayesha A et al[26].

Conclusion

This cross-section study was conducted to find out the prevalence of T2 DM and Pre-diabetes (PD) among the rural population. Overall prevalence of DM was 11.0% which is higher than some other studies conducted in rural population in Bangladesh. PD was though low but showed increasing trend. Economic status, family history of diabetes and more frequency of rice eating significantly associated with the T2 DM. Some other risk factors like overweight, less physical activities, sedentary lifestyle were insignificant with diabetes in this study. High prevalence of diabetes was evident among the female population than male.

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