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Original Article

Knowledge and Awareness of Adult Patients and Relatives about Diabetes Mellitus in a Primary Health Care Hospital

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ABSTRACT

Introduction*: To assess the knowledge & awareness about diabetes mellitus (DM) among the adult patients and accompanying persons attending at Upazilla Health Complex, Tungipara, Gopalganj.* ***Methods and Materials****: The study was a cross sectional type of descriptive study. A structured questionnaire for formal face-to-face interview about the family history, symptoms, complications, preventive measures and communicability of DM was administered to the adult patients and accompanying persons attending at the Upazilla Health Complex, Tungipara, Gopalganj.* ***Results****: A total of 325 respondents gave their comments for the study. Statistically significant differences observed in the percentage of respondents mentioned diabetes symptoms and risk factors by age, gender and educational status. Those with history of diabetes in the family indicated diabetes symptoms and diabetes risk factors more precisely. The percentage of respondents indicated diabetes complications was higher among males and awareness about diabetes complications increased with the age. Knowledge about diabetes complications was higher among the respondents with educational status 'graduate and above'. Knowledge about diabetes prevention methods was higher among males. Awareness about diabetes prevention methods increased with age and educational status. Individuals with a history of diabetes in the family were more aware of diabetes prevention methods.* ***Conclusion****: Knowledge and awareness of certain aspects of diabetes*

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among the adult patients and accompanying persons attending at the UHC, Tungipara is poor. More health education is needed to address these deficiencies in order to equip them with the knowledge to positively help their community to reduce the burden of DM on society.

***Keywords**: Diabetes mellitus (DM), Non-communicable diseases (NCDs), Residential Field Site Training (RFST)*

INTRODUCTION

Diabetes is a major public health problem regionally and globally and is a leading cause of death in most countries.[1] It remains one of the four most prevalent non-communicable diseases (NCDs) in the world [2-4]. It results in disability and premature death while creating an increasing burden on health systems, economic development, and the wellbeing of a large proportion of the global population.[5] The most common forms of diabetes are type 1 diabetes, in which complete insulin deficiency causes the destruction of the pancreatic beta cells, and type 2 diabetes, in which insulin resistance can lead to hyperglycemia [6–8]. Most diabetes cases (up to 95% of diabetic patients) are type 2 diabetes (so-called insulin-independent) [7,8].

Bangladesh is a developing country and is facing a continuous growth in the prevalence of diabetes. Diabetes and pre-diabetes affect a substantial proportion of the Bangladeshi population. Based on data from the BDHS 2017–18, over one-quarter of individuals aged 18 years and older had diabetes or pre-diabetes in Bangladesh, representing more than 19 million individuals in 2020.

According to the International Centre for Diarrhoeal Disease Research in Bangladesh in 2015, 7.1 million people had diabetes, 3.7 million cases were undiagnosed and about 129 000 deaths were attributed to the disease. The prevalence of diabetes in Bangladesh has increased 2.5 times over the last two decades from 4.0% in 1995–2000 to 10.4% in 2010–2019[9].

Factors responsible for this seems to be propensity and adaptation towards the common risk factors of DM for the citizens such as, family history, increasing obesity due to sedentary lifestyle and reduced physical activity & consuming unhealthy diet (eating junk foods, high fatty diet & low fiber intake).

It is paramount to know about the status of knowledge and awareness about DM in every societal class, as knowledge as well awareness is a critical component of behaviour change. Once knowledge is transferred and awareness is created, people are more likely to participate in prevention of incidence and complication, control and mitigation activity. Knowledge & awareness about the disease plays a vital role in its further development and its early detection, self-management and prevention. Additionally, patients diagnosed with diabetes should be actively involved in disease management, as a high level of compliance may significantly increase the quality of life and prevent/delay long-term diabetes complications [1011]. So, regular monitoring and gearing up of knowledge and public awareness about diabetes is necessary to provide effective educational and preventive strategies.

This study therefore tries to find out (1) the awareness and knowledge about DM among the population as well as (2) to

identify socio-demographic factors associated with knowledge and awareness of diabetes symptoms and risk factors within a semi-urban and rural setting involving a primary health care center as purposeful and convenient for RFST of 3rd year MBBS students under Gopalganj district in Bangladesh.

MATERIALS AND METHODS

Study design and population

This cross-sectional survey was carried out between 22nd and 31st Oct, 2023, deploying a non-random purposive sampling technique under RFST (Residential Field Site Training) program. RFST Program for third (curriculum 2012) and fourth year MBBS (curriculum 2021) students is an integral part of the curriculum of the subject 'Community Medicine & Public Health'.

Respondents (≥ 18 years) were chosen purposively as on the spot and on convenience basis of the 3rd year MBBS students which was given priority during the survey and under close supervision of the teachers of the department of Community Medicine and Public Health (the four authors). A formal face-to-face interview method was applied along with prior verbal informed consent. Students were dispersed for data collection both individually and in groups (2 to 3 in each group) in different sections of the health complex, such as all indoor wards (male & female), outdoor, EPI section, IMCI center, NCD corner, casualty, emergency, pathological laboratory etc.

The survey was carried out as part of MBBS curriculum fulfilment as well as academic exercise. In spite of that, the study protocol was reviewed and approved by the Ethical Review Board of Sheikh Sayera Khatun Medical College (a government owned medical college), Gopalganj on 10th Oct, 2023.

Questionnaire and measures

The research tool was a questionnaire developed for the purpose of the study. In preparation for the questionnaire, the previously published studies on knowledge & awareness about DM were analyzed. Selection of the variables was based principally on Diabetic Knowledge Questionnaire (DKQ24) and Diabetes Knowledge Test (DKT) questionnaire, though the technical situation and community context related drawbacks limited the total use of those ideals. The questionnaire included five questions related to the knowledge and awareness about symptoms, risk factors, prevention methods, complications and communicability of diabetes, as well as questions regarding the history of diabetes in the family and common socio-demographic variables.

Knowledge & awareness about diabetes symptoms

Respondents were asked about their knowledge & awareness of the symptoms of DM, using the question 'What do you know about the symptoms of diabetes?' There were pre-selected six common symptoms with each having 'yes' or 'no' options for answer namely, polyuria, increased hunger (polyphagia), increased thirst (feeling of a dry mouth (polydipsia), chronic fatigue (feeling sleepy during the day), unexpected excessive weight loss and others.

Knowledge & awareness of the risk factors for diabetes

Respondents were asked about their knowledge and awareness of the risk factors for diabetes, using the question, 'what do you know about the risk factors for diabetes?' There were pre-selected four common risk factors with each having 'yes' or 'no' options for answer namely, overweight/obesity, low physical activity level (e.g., sedentary lifestyle), unhealthy diet (eating junk foods, high fatty diet & low fiber intake) and genetic predisposition (history of diabetes in the family).

Knowledge & awareness about diabetes prevention methods

Respondents were asked about their knowledge and awareness of the diabetes prevention methods, using the question, 'what do you know about diabetes prevention methods?' There were pre-selected four common preventive methods with each having 'yes' or 'no' options for answer namely, regular physical activity, limited intake of fats in the diet, limited consumption of carbohydrates (sugars) in the diet and weight reduction in overweight or obese people.

Knowledge & awareness about complications of diabetes

Respondents were asked about their knowledge and awareness of the diabetes complications, using the question, 'What do you about diabetes complications?' There were pre-selected four common complications with each having 'yes' or 'no' options for answer namely, heart diseases such as heart attack or stroke, kidney damage, vision problems/loss of vision and diabetic ulcer of the foot.

Moreover, respondents were asked about the communicability of DM using the question 'Is diabetes a communicable disease?' with having 'yes' or 'no' options for answer.

Data analysis

The data were analyzed with SPSS software. The distribution of categorical variables was shown by frequencies and proportions. Cross-tabulations and chi-squared tests were used to compare and analyze as well as to see association among the categorical variables. Associations between personal and socio-demographic characteristics such as, age, gender, educational status, occupational status, monthly family income, family history of diabetes and knowledge & awareness of diabetes symptoms, risk factors, preventive methods, complications and communicability for diabetes were analyzed. The level of statistical significance was set at $p < 0.05$.

RESULTS

Socio-demographic characteristics of the participants

A total of 325 respondents (195 females and 130 males) took part in the study aged 18 – 65 years. Most of the respondents (152 individuals; 46.8%) were in the age group of 25 – 44 years. Educational level of most of the respondents (136 individuals, 41.8%) were in the primary level, while only 12.3% were in the 'graduate and above' level. Most of the respondents were housewives (150 in number and 46.1%). Most of the respondents (184 in number and 56.6%) have monthly family income between 10,000 to 20,000 Tk. There was a family history of DM in 126 (38.7%) of the respondents.

Table 1: Characteristics of the respondents (*n* = 325)

Variable	Total sample *n* = 325	
Overall	***n***	**%**
Age (years)		
18 – 24	84	25.8
25 – 44	152	46.8
45 – 60	79	24.3
> 60	10	3
Gender		
Male	130	40
Female	195	60
Educational status		
No education	44	13.5
Primary	136	41.8
SSC	66	20.3
HSC	39	12
Graduate & above	40	12.3
Occupational status		
Farmer	30	9.2
Service	46	14.1
Business	20	6.1
Day laborer	15	4.6
Housewife	150	46.1
Others	64	19.7
Monthly income of the family		
Tk. < 10,000	74	22.7
Tk. 10,000 – 20,000	184	56.6
Tk. 20,001 – 40,000	57	17.5
Tk. > 40,000	10	3.3
Family history of DM		
Yes	126	38.7
No	199	61.3
What do you know about the symptoms of diabetes?		
Polyuria	263	80.9
Polyphagia	213	65.5
Polydipsia	197	60.6
Fatigue	204	62.7
Weight loss	182	56
Others	0	0
What do you know about the risk factors for diabetes?		
Obesity/overweight	216	66.5
Sedentary lifestyle	225	69.2
Unhealthy diet	230	70.7
Genetic predisposition	190	58.5
What do you know about diabetes prevention methods?		
Regular physical activity	281	86.5
Limited fat intake	246	75.7
Limited carbohydrate intake	260	65
Weight reduction in obese people	228	97
What do you know about diabetes complications?		
Heart disease	184	56.6
Kidney damage	163	50.1
Vision problem	197	60.6
Diabetic foot ulcer	215	66.1
Do you think diabetes a communicable disease?		
Yes	67	20.6
No	258	79.4

Respondents knowledge and awareness about diabetes

Out of five symptoms of diabetes analyzed in this study, polyuria (80.9%), polyphagia (65.5%) and chronic fatigue, feeling sleepy during the day (62.7%) were the most recognized symptoms. 60.6% of the respondents have knowledge about polydipsia is a symptom of diabetes and only 56% of respondents mentioned weight loss as a symptom of diabetes.

Out of four diabetes risk factors analyzed in this study, percentage of recognized risk factors was unhealthy diet (70.7%), sedentary lifestyle (69.2%), overweight/obesity (66.5%) and genetic predisposition (58.5%) were the most recognized diabetes risk factors.

Regarding preventive methods of DM, two hundred and eighty one respondents (86.5%) agreed that regular physical activity could help in the prevention of DM. Two hundred and sixty respondents (80 %) agreed that limited carbohydrate intake is important in the prevention of diabetes. 246 (75%) and 228 (70%) respondents know about limited fat intake and weight reduction in obese people respectively are the preventive measure for DM.

Regarding complications of diabetes, most of the respondents (215 individuals and 66.1%) are aware about the diabetic ulcer of the foot followed by vision problem (60.6%) heart disease (56.6%) and kidney damage (50.1%).

Regarding communicability of DM, 258 (79.4%) individuals positively mentioned that diabetes is not a communicable disease.

Statistically significant differences observed in the percentage of respondents mentioned diabetes symptoms by age, gender and educational status. Statistically significant differences observed in the percentage of respondents who correctly indicated diabetes risk factors depending on the gender, age and educational level. Occupational status and monthly family income both have less impact on the knowledge and awareness about diabetes symptoms and complications. Those with history of diabetes in the family indicated diabetes symptoms and diabetes risk factors more positively and additionally were more aware of diabetes complications. The percentage of respondents indicated diabetes complications was higher among males and awareness about diabetes complications increased with the age. Knowledge about diabetes complications was higher among the respondents with educational status ‘graduate and above’.

Knowledge about diabetes prevention methods was higher among males. Awareness about diabetes prevention methods increased with age and educational status. Individuals with occupational status ‘service-holder’ and ‘housewives’ more positively mentioned limited carbohydrate intake as a diabetes prevention method. Individuals with a history of diabetes in the family were more aware of diabetes prevention methods.

Respondents in the age group ‘45-60’ were more aware about diabetes symptoms such as, polyuria, polydipsia, polyphagia, chronic fatigue and weight loss. Males were more likely to indicate obesity/overweight, sedentary lifestyle, unhealthy diet and genetic predisposition as diabetes risk factors. Respondents with higher monthly family income were more likely to indicate obesity/overweight and an unhealthy diet as diabetes risk factors.

DISCUSSION

In the Bangladesh government health-care delivery systems at the upazila (sub-district) level, there are 460 Upazila Health complexes (UHC) to provide inpatient & outpatient, Primary health care, family-planning services, and other preventive healthcare services to its population care to its population. Visit to a local UHC is mandatory for MBBS 3rd year students for 10 days duration. This includes conduction of a field survey by the students in context with local health and socio-cultural condition. We, the authors decided to conduct this survey of this batch with the following topic.

Though the RFST study is not ideal to conduct any research purpose and draw inferences. Because it goes with various limitations. But if it is done with proper supervision of the respective teachers, data authenticity can be maintained and other limitations can be minimized. Of course this study cannot be generalized as on the general population, as because the study was carried out 'on the spot' respondents within the hospital premises but it can open the door to initiate further study over the topic.

This study revealed the level of general knowledge and awareness about DM. Among the five symptoms of diabetes analyzed in this study, almost all of them were correctly indicated by more than 50% of the respondents. Most of the respondents were able to mention obesity/overweight, sedentary lifestyle, unhealthy diet and genetic predisposition as risk factors for diabetes. Respondents were also able to correctly identify most of the complications caused by diabetes, as well as preventive measures. Public awareness of selected aspects of diabetes varied by socio-demographic factors such as, age, gender, educational & occupational status, monthly family income and family history of diabetes were also studied. Awareness about symptoms of diabetes is crucial to early detection and proper management of the disease. However, the current study revealed a low level of awareness of studied major symptoms of diabetes within the rural population in Bangladesh.

Knowledge of diabetes and its risk factors is very limited in rural Bangladesh. The development of public health programmes to increase knowledge of diabetes and its complications is required to assist people living in rural Bangladesh to control and management of diabetes. According to the review conducted by Gautam and Gupta knowledge is considered a key element in the control of diabetes mellitus epidemics[12-14]. Significant gaps in general awareness and knowledge about DM in Bangladesh exist, especially related to awareness of diabetes risk factors.

In this study, males with educational status 'graduate and above' respondents with a history of diabetes in the family were more able to correctly indicate symptoms of diabetes. A healthy lifestyle pattern is a well-known factor associated with decreased risk for diabetes, especially type 2 diabetes [15]. The study showed that knowledge about risk factors of diabetes in rural people is inadequate. Most of the respondents were able to point out obesity/overweight, sedentary lifestyle, unhealthy diet and genetic predisposition as diabetes risk factors. Males and respondents ≥45 years were more able to indicate these risk factors than other respondents. Having a higher education also influenced the public awareness of risk factors of diabetes.

A higher level of awareness of obesity/overweight, sedentary lifestyle & unhealthy diet as a risk factor for diabetes may result from recent years extensive campaigns regarding non-communicable diseases that are being carried out in Bangladesh. In addition to establishment of NCD corner in the district hospitals, these has already been established in all the health complexes. Where we have seen that counselling and other related management was going on actively. Particular attention should be given to female education who presented a lower level of aware-ness of diabetes risk factors. Findings from this study on awareness of diabetes prevention methods reflect the knowledge of respondents about its risk factors. The most recognized diabetes prevention methods were regular physical activity, limited consumption of carbohydrates in the diet, weight reduction and limited fat intake. A higher level of awareness of diabetes prevention methods was associated with higher age and educational level.

It is believed that effective diabetes education can minimize the risk of long-term diabetes complications.[16] Findings from this study showed that diabetic ulcer of the foot were most recognized complication by the respondents. This finding underlines the need to increase the level of knowledge and public awareness about those diabetes complications, especially those which are late notified. As in the case of risk factors, symptoms, and prevention methods, awareness of diabetes-related complications was significantly associated with male gender, ≥45 age and 'graduate and above' education level status.

Among the socio-demographic factors analyzed in this study, male gender, age ≥45 years and educational level 'graduate and above' were the most important factors significantly associated with a higher level of general knowledge and awareness about diabetes. Findings from this study also showed, that having a person with diabetes in the family leads to a better understanding of this condition. These may supplement, but should not substitute a proper diabetic education, that should be provided as a part of a public health intervention on diabetes. Finally, it seems that effectiveness of currently available educational as well as awareness activities for diabetes prevention and management is limited and requires further improvements.

The study reveals an inadequate level of knowledge & public awareness of diabetes, its risk factors, symptoms, and complications, as well as preventive methods. Additionally, about 20.6% respondents who mentioned that diabetes is a communicable disease either mal-informed or mal-educated. Whatever may be, it points out about poor delegation of knowledge & consciousness about general health of people. This finding underlines a need to conduct a nationwide educational campaign on diabetes. Personalized communication should be targeted to younger individuals as well as females without higher education, as these groups were identified as those with the lowest level of knowledge & awareness of diabetes. General practitioners as well as medicine specialists should be actively involved in diabetes educational activities targeted to those at higher risk of diabetes. Findings from this study also underline the positive influence of having a family member with diabetes on the level of awareness of diabetes among other family members. Further studies should analyze

the impact of the health system and diabetes education provided by healthcare workers on general knowledge and public awareness of diabetes.

CONCLUSIONS

This study demonstrated lack of public awareness and knowledge about diabetes among adults in Bangladesh. Gender and educational status were the most important factors significantly associated with the knowledge and awareness of the related factors of diabetes, while monthly family income and occupational status were supposed to be less relevant factor. Moreover, the current study indicated significant gaps in the knowledge about risk factors for diabetes and its complications, as well as methods to prevent them. The presented information outlines the importance of adopting a more comprehensive education strategy in addition to ongoing activities regarding diabetes care in Bangladesh. Further study regarding knowledge and awareness about diabetes among the rural people is necessary to clarify and pick the original situation is necessary.

Limitations of the study:

The study questionnaire was limited to the most prevalent symptoms, risk factors, and complications. Other few important risk factors such as, smoking, alcohol consumption etc. were omitted. History of diabetes (i.e., diagnosed by a doctor, diabetes in the family) was self-declared. The research method includes only subjects (patients and accompanying persons) who were confronted on the spot with the students only at the time of data collection. Though the research findings are not generalizable, it can give an insight regarding the knowledge and awareness factors about diabetes mellitus among the semi-urban and rural communities of Bangladesh.

Data availability statement: The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement:

As the research was conducted as a part of RFST in accordance with curriculum of 3rd year MBBS students for Bangladesh (2012), so by default no further clearance is necessary. In spite of this, the study protocol was reviewed and approved by the Ethical Review Board of SSKMC. The patients and/or participants provided their verbal informed consent to participate in this study.

Declaration of conflicting interests:

The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication. As the study was conducted as a part of RFST program, there is no question of financial benefit related with the research.

Author contributions

MA Sattar: conceptualization, formal analysis, investigation, project administration, visualization, and writing. AK: conceptualization, investigation & methodology. AKS: conceptualization & supervision. SB: Supervision and conceptualization. All authors contributed to the article and approved the submitted version.

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REFERENCES:

1. *Zimmet PZ, Magliano DJ, Herman WH, et al. Diabetes: a 21st century challenge. Lancet Diabetes Endocrinol 2014; 2:56-64. doi:10.1016/S22138587(13)70112-8 pmid: http: //www. ncbi.nlm.nih.gov/ pubmed /24622669*
2. *Standl E, Khunti K, Hansen TB, Schnell O. The global epidemics of diabetes in the 21st century: Current situation and perspectives. Eur J Prev Cardiol. (2019) 26:7–14. doi: 10.1177/2047487319881021*
3. *Saeedi P, Petersohn I, Salpea P, Malanda B, Karuranga S, Unwin N, et al. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th edition. Diabetes Res Clin Pract. (2019) 157:107843. doi: 10.1016/j.diabres.2019.107843*
4. *Cho NH, Shaw JE, Karuranga S, Huang Y, da Rocha Fernandes JD, Ohlrogge AW, et al. IDF Diabetes Atlas: Global estimates of diabetes prevalence for 2017 and projections for 2045. Diabetes Res Clin Pract. (2018) 138:271– 81. doi: 10.1016/j.diabres.2018.02.023*
5. *World Health Organization. Noncommunicable Diseases Progress Monitor 2020 (2022). Available online at: https://www.who.int/publications/i/item/ 9789240000490 (accessed Nov, 2023).*
6. *Banday MZ, Sameer AS, Nissar S. Pathophysiology of diabetes: An overview. Avicenna J Med. (2020) 10:174–88. doi: 10.4103/ajm.ajm_53_20*
7. *Tao Z, Shi A, Zhao J. Epidemiological Perspectives of Diabetes. Cell Biochem Biophys. (2015) 73:181–5. doi: 10.1007/s12013-015-0598-4*
8. *Xu G, Liu B, Sun Y, Du Y, Snetselaar LG, Hu FB, et al. Prevalence of diagnosed type 1 and type 2 diabetes among US adults in 2016 and 2017: population based study. BMJ. (2018) 362:k1497. doi: 10.1136/bmj.k1497*
9. *Akhtar S, Nasir JA, Sarwar A, et al. Prevalence of diabetes and pre-diabetes in Bangladesh: a systematic review and meta-analysis. BMJ Open 2020; 10:e036086. doi: 10.1136/bmjopen-2019-036086*
10. *Funnell MM, Anderson RM. MSJAMA the problem with compliance in diabetes. JAMA. (2000) 284:1709. doi: 10.1001/jama.284.13.1709-JMS1004-6-1*
11. *Garcia AA, Villagomez ET, Brown SA, Kouzekanani K, Hanis CL. The Starr County Diabetes Education Study: development of the Spanish-language diabetes knowledge questionnaire. Diabetes Care. (2001) 24:16– 21. doi: 10.2337/diacare.24.1.16*
12. *Meng-Hsueh Hsieh, Yu-Ching Chen, Chun-Heng Ho, Chung-Ying Lin. Validation of Diabetes Knowledge Questionnaire (DKQ) in the Taiwanese Population - Concurrent Validity with Diabetes-Specific Quality of Life Questionnaire Module. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy. 2022 Aug 9: 15: 2391 – 2403. doi: 10. 2147/ DMSO. S369552. eCollection 2022.*
13. *Survey Form : Diabetic Knowledge Questionnaire (DKQ-24) English*
14. *Gautam SK, Gupta V. Impact of knowledge, attitude and practice on the management of type 2 diabetes mellitus in developing countries: a review. Curr Diabetes Rev. (2022) 18: e010521189965. doi: 10.2174/1573399817666210106104230*

15. *Bellou V, Belbasis L, Tzoulaki I, Evangelou E. Risk factors for type 2 diabetes mellitus: An exposure-wide umbrella review of meta-analyses. PLoS ONE. (2018) 13:e0194127. doi: 10.1371/journal.pone.0194127*

16. *Nazar CM, Bojerenu MM, Safdar M, Marwat J. Effectiveness of diabetes education and awareness of diabetes mellitus in combating diabetes in the United Kigdom; a literature review. J Nephropharmacol. (2015) 5:110–5.*