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# Frequency of Metabolic Syndrome and Lipid Profile Analysis among Patient with Type 2 Diabetes: A Single Center Study

Dr. Md. Zillur Rahman[1*], Dr. Nazmun Nahar[2], Dr. Rawshan Akhtar[3], Dr. Md. Mahbubul Alam[4], Dr. Shamsul Alom Swapon[5], Dr. Rubaiyat Rashid[6], Dr. Abdul Hamid Mollah[7]

[1]Associate Professor, Department of Medicine, North Bengal Medical College, Sirajgonj, Bangladesh
[2]Ex-Associate Professor, Department of Obstetrics & Gynecology, Rajshahi Medical College Hospital, Rajshahi, Bangladesh
[3]Assistant Professor, Department of Obstetrics & Gynecology, Rajshahi Medical College Hospital, Rajshahi, Bangladesh
[4]Assistant Professor, Department of Medicine, Pabna Medical College, Pabna Bangladesh
[5]Associate Professor, Department of Cardiology, North Bengal Medical College, Sirajgonj, Bangladesh
[6] Medical Officer, Pediatric cardiology, National Heart Foundation and Research Institute, Dhaka, Bangladesh
[7]Assistant Professor, Department of Medicine, North Bengal Medical College, Sirajgonj, Bangladesh

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***Corresponding author:** Dr. Md. Zillur Rahman
Associate Professor, Department of Medicine, North Bengal Medical College, Sirajgonj, Bangladesh
Email: zillurrahman18981@gmail.com

**Abstract** **Original Research Article**

***Background:*** Diabetes mellitus is associated with various metabolic disorders, which leads to the progression of the disease and its complications. Dyslipidemia has been noted to play an integral role in the pathogenesis and progression of micro and macro vascular complications in diabetes mellitus (DM) patients. Lipid profile is the indicators of dyslipidemia. ***Aim of the Study:*** The aim of this study was to accumulate the frequency of metabolic syndrome and lipid profile among patient with type 2 diabetes. ***Methods:*** This hospital based descriptive type of observational study was conducted in the Department of Medicine, North Bengal Medical College and Hospital, Sirajgonj, Bangladesh during the period from January 2022 to December 2022. In total 97 diagnosed patients with type 2 diabetes mellitus were enrolled in this study as the study subjects. Proper written consents were taken from all the participants before data collection. All demographic as well as clinical data were recorded. Data were processed, analyzed and disseminated by using MS Excel and SPSS version 23.0 program as per necessity. ***Results*:** The highest number (37%) of our participants was from 41-50 years' age group and the female participants were dominating in number. Majority of the patients (63%) were obese: ≥30. In this current study, the frequency of metabolic syndrome was found as 71%. The mean± SD total cholesterol, triglyceride, LDL cholesterol and HDL cholesterol of the respondents were found as 179.88±42.81, 179.88±42.81, 109.74±46.69 and 44.75±7.68 mg/dL respectively. Among the majority of our patients (72%) normal (≥40 mg/dL) HDL level was found. ***Conclusion:*** The higher frequency of metabolic syndrome among type 2 diabetes patients demands more attention from health professionals as well as the policy makers. There may not have any significant correlation of metabolic syndrome or type 2 diabetes with lipid profile but aged people may be prone to those diseases.

**Keywords:** Lung Diseases, Chest, HRCT.



## 1. INTRODUCTION

Type 2 diabetes is a complex disorder of impaired glucose tolerance, insulin resistance and lipid abnormalities. There is a rapid increase in the prevalence of diabetes due to modernization and urbanization that has resulted in a substantial burden on the healthcare services [1]. The top three countries with highest rates of diabetes include India, China and United States with alarming rates of prevalence of diabetes [2]. There is a sharp increase in the population with diabetes from 19 million in 1995 to 66.8 million in 2015 in India which is predicted to increase to 123.5 million by 2040. The crude prevalence rate of diabetes in urban areas is about 9% and the prevalence in rural areas has also increased to around 3% of the total population [3]. Metabolic syndrome is defined as a cluster of cardiovascular risk factors which include dysglycemia, central obesity, hypertension and dyslipidemia. There are different definitions of metabolic syndrome given by WHO [4], NCEP ATP-III

[5] with little variations in each. Type 2 diabetes and metabolic syndrome are both heterogeneous and complex conditions due to the interaction between environmental and genetical factors and in the population with type 2 diabetes, nearly 70-80% are diagnosed with metabolic syndrome [6, 7]. There is growing evidence that like diabetes, metabolic syndrome besides resulting in macro-vascular complications also causes micro-vascular complications in type 2 diabetes patients [8, 9]. The risk of macro-vascular and micro-vascular complications increases with metabolic syndrome in combination with diabetes due to associated dyslipidemia, hypertension and obesity [8]. The studies in American and European populations have shown the correlation between metabolic syndrome and macro- and micro-vascular complications, in patients with diabetes [10, 11]. Some previous studies have looked into the metabolic syndrome prevalence in general population [12, 13]. There are few studies that have calculated the prevalence in the diabetic population [10, 14] but there is complete paucity of such studies in the population of Northern Punjab. The present study aimed at determining the prevalence of metabolic syndrome in type 2 diabetes patients according to IDF criteria [15] and to analyze lipid profile of the participants.

## 2. METHODOLOGY

This hospital based descriptive type of observational study was conducted in the Department of Medicine, North Bengal Medical College and Hospital, Sirajgonj, Bangladesh during the period from January 2022 to December 2022. In total 97patients with diagnosed type 2 diabetes mellitus were enrolled in this study as study subjects. Proper written consents were taken from all the participants before data collection. The whole intervention was conducted in accordance with the principles of human research specified in the Helsinki Declaration [16] and executed in compliance with currently applicable regulations and the provisions of the General Data Protection Regulation (GDPR) [17]. As per the inclusion criteria of this study patient with diagnosed type 2 diabetes mellitus and age- more than 30 years were included. On the other hand, according to the exclusion criteria of this study, patients with acute illness (e.g. Stroke, myocardial infarction), other co-morbidity (e.g. genetic or congenital defect in height and weight, ascites, pregnancy) and on regular anti-dyslipidemia drugs, diuretics and beta blocker were excluded. All the demographic and clinical data of the participants were recorded. A predesigned questioner was used in data collection. All data were processed, analyzed and disseminated by using MS Excel and SPSS version 23.0 program as per necessity.

## 3. RESULT

In this study, among total 97 participants, 47% were male whereas the rest 53% were female. So, female participants were dominating in number and the male-female ratio was 1:1.1. In this study, we observed that, the highest number (37%) patients were from 41-50 year's age group, 33% were from 51 to 60 years age group. Among total 97 participants, 47% were male whereas the rest 53% were female. So, female participants were dominating in number. In this current study, the frequency of metabolic syndrome was found as 71% among total participants who were the patient with type 2 diabetes. In analyzing the frequency of metabolic syndrome across different age groups, we observed that the largest number of the patients (27%) with metabolic syndrome were from 41-50 years' age group. Besides this, 24% metabolic syndrome patients were from 51-60 year's age group which was also noticeable. In this current study, the mean± SD total cholesterol, triglyceride, LDL cholesterol and HDL cholesterol of the respondents were found as 179.88±42.81, 179.88±42.81, 109.74±46.69 and 44.75±7.68 mg/dL respectively. In analyzing the triglyceride level of our participants, observed that, 33% had High (150-199 mg/dL) level and 38% had hypertriglyceridemia (200-499 mg/dL) level. Among our total participants, 43% had Optimal (<100 mg/dL) and 30% had Near/above optimal (100-129 mg/dL) LDL level. Among the majority of our patients (72%) normal (≥40 mg/dL) was found.

**Table 1: Socio-demographic characteristics of the study population (N=97)**

| Characteristics | n | % |
|---|---|---|
| **Age in years** | | |
| 31-40 yrs. | 17 | 18% |
| 41-50 yrs. | 36 | 37% |
| 51-60 yrs. | 32 | 33% |
| 61-70 yrs. | 12 | 12% |
| **Gender** | | |
| Male | 46 | 47% |
| Female | 51 | 53% |
| **BMI (kg/m²)** | | |
| Normal: <25 | 8 | 8% |
| Overweight: 25–29.9 | 28 | 29% |
| Obese: ≥30 | 61 | 63% |

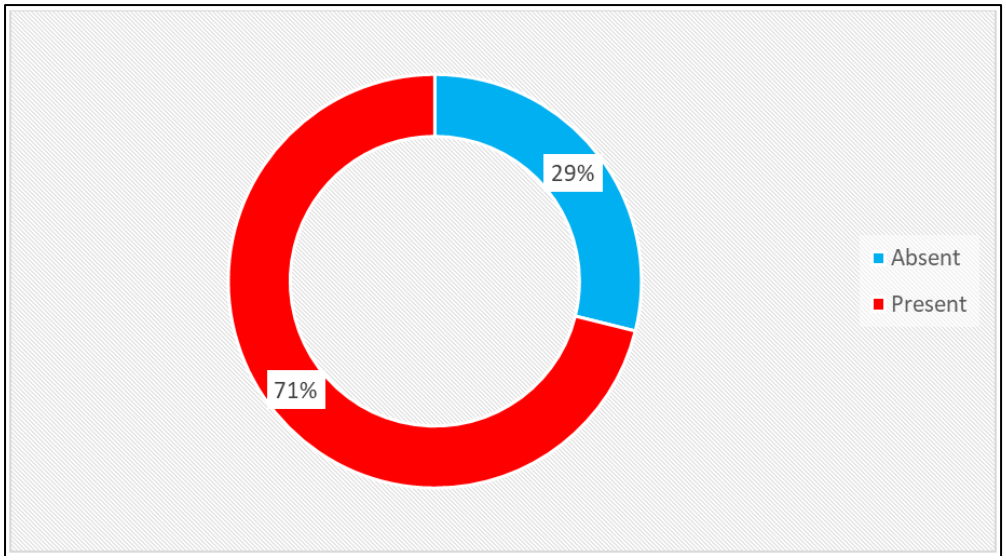


**Figure 1: Frequency of metabolic syndrome among study population (N = 97)**

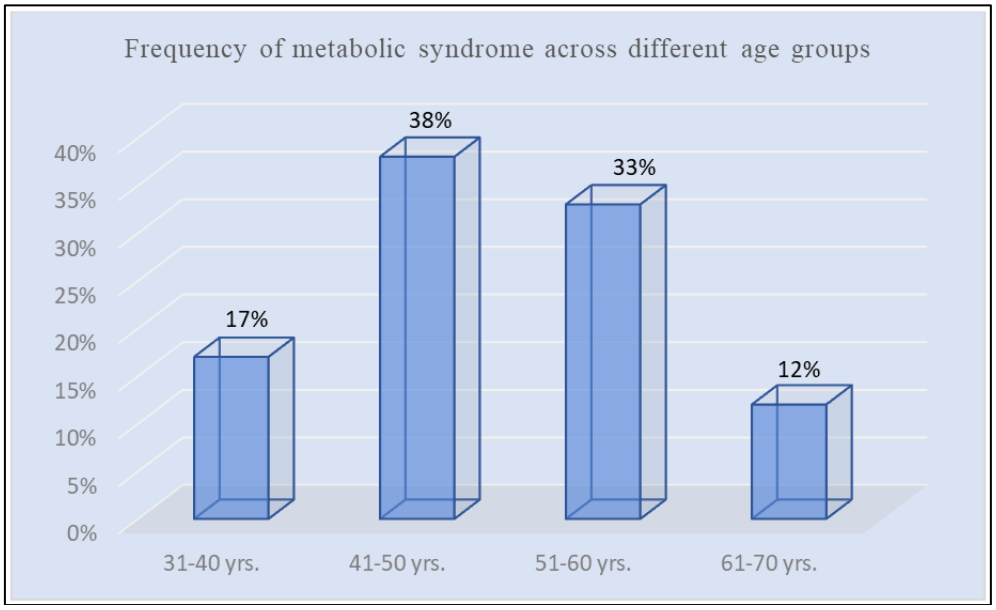


**Figure 2: Frequency of metabolic syndrome across different age groups in year (N=97)**

**Table 2: Distribution of total cholesterol among participants (N=97)**

| Total cholesterol | n | % |
|---|---|---|
| Desirable: <200 mg/dL | 59 | 61% |
| Borderline high: 200-239 mg/dL | 26 | 27% |
| High: >239 mg/dL | 12 | 12% |
| Mean± SD | 197.44±38.39 | |

**Table 3: Distribution of triglyceride among participants (N=97)**

| Triglyceride | n | % |
|---|---|---|
| Normal: <150 mg/dL | 27 | 28% |
| High: 150-199 mg/dL | 32 | 33% |
| Hypertriglyseridemic:200-499 mg/dL | 37 | 38% |
| Very high: >499 mg/dL | 1 | 1% |
| Mean± SD | 179.88±42.81 | |

**Table 4: Distribution of LDL cholesterol among participants (N=97)**

| LDL Cholesterol | n | % |
|---|---|---|
| Optimal: <100 mg/dL | 42 | 43% |
| Near/above optimal: 100-129 mg/dL | 29 | 30% |
| Borderline high: 130-159 mg/dL | 17 | 18% |
| High: 160-189 mg/dL | 7 | 7% |
| Very high: >189 mg/dL | 2 | 2% |
| Mean± SD | 109.74±46.69 | |

**Table 5: Distribution of HDL cholesterol among participants (N=97)**

| HDL cholesterol | n | % |
|---|---|---|
| Normal: ≥40 mg/dL | 70 | 72% |
| Low: <40 mg/dL | 27 | 28% |
| Mean± SD | 44.75±7.68 | |

## 4. DISCUSSION

The aim of this study was to accumulate the frequency of metabolic syndrome and lipid profile among patient with type 2 diabetes. In this study, we observed that, the highest number (37%) of patients were from 41-50 years' age group, 33% were from 51 to 60 years' age group. Among total 97 participants, 47% were male whereas the rest 53% were female. So, female participants were dominating in number. But in another study [18], male participants were higher in number where males were 56.5% and females were 43.5%. In analyzing BMI, we found that, 8% were with normal BMI (<25), 29% were overweight (25–29.9) and 63% were obese ≥30. In another study, [19] the overall mean value of BMI was found 26.43 kg/m2, whereas the mean BMI of female was found as significantly higher than that of male. In this current study, the frequency of metabolic syndrome was found as 71% among total participants who were the patient with type 2 diabetes. One previous study indicated that, individuals with metabolic syndrome are four times more likely to develop T2DM [20]. In analyzing the frequency of metabolic syndrome across different age groups, we observed that, the largest number of the patients (27%) were with metabolic syndrome who were from 41-50 years' age group. Besides this, 24% metabolic syndrome patients were from 51-60 years' age group which is in accordance with the study done in South Asians [21]. In this current study, we observed that, the mean± SD total cholesterol, triglyceride, LDL cholesterol and HDL cholesterol of the respondents were found as 179.88±42.81, 179.88±42.81, 109.74±46.69 and 44.75±7.68 mg/dL respectively. In analyzing the triglyceride level of our participants, we observed that, 33% had High (150-199 mg/dL) and 38% had Hypertriglyceridemia (200-499 mg/dL) level. Among our total participants, 43% had optimal (<100 mg/dL) and 30% had near/above optimal (100-129 mg/dL) LDL level. Among the majority of our patients (72%) normal (≥40 mg/dL) HDL level was found. Sarkar *et al.*, in 2009 (Bangladesh) showed the hypertriglyceridemia in 58% type 2 diabetic patients [22]. But a study conducted in Pakistan in 2011 showed hypertriglyceridemia in 78% cases [23]. Our study findings are consistent with the study of Onuigbo *et al.*, [24] noted that, the study by Singh and Kumar [25] found 89% of type 2 diabetic patients with low HDL-C.

### Limitation of the Study

This was a single centered study with small sized samples. Moreover, the study was conducted at a very short period of time. So, the findings of this study may not reflect the exact scenario of the whole country.

## 5. CONCLUSION & RECOMMENDATION

The higher frequency of metabolic syndrome among type 2 diabetes patients demands more attention from health professionals as well as the policy makers. There may not have any significant correlation of metabolic syndrome or type 2 diabetes with lipid profile but aged people may be prone to those diseases. For getting more specific results, we would like to recommend for conducting similar more studies in several places in several places with larger sized samples.

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**Conflict of Interest:** None declared.

## REFERENCES

1. Chan, J. C., Malik, V., Jia, W., Kadowaki, T., Yajnik, C. S., Yoon, K. H., & Hu, F. B. (2009). Diabetes in Asia: epidemiology, risk factors, and pathophysiology. *Jama*, *301*(20), 2129-2140.
2. Shaw, J. E., Sicree, R. A., & Zimmet, P. Z. (2010). Global estimates of the prevalence of diabetes for 2010 and 2030. *Diabetes research and clinical practice*, *87*(1), 4-14.
3. http://diabetesindia.com/diabetes/itfdci.htm
4. Alberti, K. G., & Zimmet, P. Z. (1998). Definition, diagnosis and classification of diabetes mellitus and its complications. *Diabet Med*, 15, 539-553.
5. National Cholesterol Education Program (NCEP) (2002) Expert panel on detection and treatment of high blood cholesterol in adult. 106, 3143-3421.
6. Alexander, C., Landsman, P. B., Teutsch, S. M., & Haffner, S. M. (2003). Third National Health and Nutrition Examination Survey (NHANES III) National Cholesterol Education Program (NCEP). *Diabetes*, 52, 1210- 1214.
7. Bonora, E., Kiechl, S., Willeit, J., Oberhollenzer, F., Egger, G., Targher, G., ... & Muggeo, M. (1998). Prevalence of insulin resistance in metabolic disorders: the Bruneck Study. *Diabetes*, *47*(10), 1643-1649.
8. Shimajiri, Y., Tsunoda, K., Furuta, M., Kadoya, Y., Yamada, S., Nanjo, K., & Sanke, T. (2008). Prevalence of metabolic syndrome in Japanese type 2 diabetic patients and its significance for chronic vascular complications. *Diabetes research and clinical practice*, *79*(2), 310-317.
9. Szalat, A., Raz, I. (2006). Metabolic syndrome and microangiopathy. *Isr Med Assoc J*, 8, 424-425.
10. Bonadonna, R. C., Cucinotta, D., Fedele, D., Riccardi, G., & Tiengo, A. (2006). The metabolic syndrome is a risk indicator of microvascular and macrovascular complications in diabetes: results from Metascreen, a multicenter diabetes clinic-based survey. *Diabetes care*, *29*(12), 2701-7.
11. Costa, L. A., Canani, L. H., Lisboa, H. R. K., Tres, G. S., & Gross, J. L. (2004). Aggregation of features of the metabolic syndrome is associated with increased prevalence of chronic complications in type 2 diabetes. *Diabetic Medicine*, *21*(3), 252-255.
12. Strazzullo, P., Barbato, A., Siani, A., Cappuccio, F. P., Versiero, M., Schiattarella, P., ... & Farinaro, E. (2008). Diagnostic criteria for metabolic syndrome: a comparative analysis in an unselected sample of adult male population. *Metabolism*, *57*(3), 355-361.

13. Wasir, J. S., Misra, A., Vikram, N. K., Pandey, R. M., & Gupta, R. (2008). Comparison of definitions of the metabolic syndrome in adult Asian Indians. *JAPI*, *56*, 158-64.
14. Lu, B., Yang, Y., Song, X., Dong, X., Zhang, Z., Zhou, L., ... & Hu, R. (2006). An evaluation of the International Diabetes Federation definition of metabolic syndrome in Chinese patients older than 30 years and diagnosed with type 2 diabetes mellitus. *Metabolism*, *55*(8), 1088-1096.
15. Alberti, S. G., Zimmet, P., Shaw, J., & Grundy, S. M. (2006). The IDF consensus worldwide definition of the metabolic syndrome. *International Diabetes Federation*, pp: 1-23.
16. World Medical Association. (2001). World Medical Association Declaration of Helsinki. Ethical principles for medical research involving human subjects. *Bulletin of the World Health Organization*, 79(4), 373 - 374. World Health Organization. https://apps.who.int/iris/handle/10665/268312.
17. Voigt, P., & Axel von dem, B. (2017). "Enforcement and fines under the GDPR." The EU General Data Protection Regulation (GDPR). Springer, Cham, 201-217.
18. Shakya, D., & Vijay, K. C. (2019). Prevalence of metabolic syndrome in patients with type 2 diabetes mellitus in a tertiary care hospital. *Medical Journal of Shree Birendra Hospital*, 18(2), 36-41.
19. Nsiah, K., Shang, V. O., Boateng, K. A., & Mensah, F. O. (2015). Prevalence of metabolic syndrome in type 2 diabetes mellitus patients. *International Journal of Applied and Basic Medical Research*, *5*(2), 133.
20. Wannamethee, S. G., Shaper, A. G., Lennon, L., & Whincup, P. H. (2005). Hepatic en- zymes, the metabolic syndrome, and the risk of type 2 diabetes in older men. *Diabetes Care*, 28(12), 2913-2918.
21. Nestel, P., Lyu, R., Low, L. P., Sheu, W. H. H., Nitiyanant, W., Saito, I., & Tan, C. E. (2007). Metabolic syndrome: recent prevalence in East and Southeast Asian populations. *Asia Pacific journal of clinical nutrition*, *16*(2), 362-367.
22. Sarkar, B. C., Sana, N. K., & Sarker, G. K. (2009). Serum Lipid Profile of Type- 2 Diabetic Patients in the Dhaka city of Bangladesh. *Research & Reviews in Bio Sciences*, 3.
23. Sultana, R., Parveen, N., & Khan, G. J. (2011). Study of Lipoprotein Patient as an Atherogenic Factor in Type 2 Diabetes Mellitus. *J. Med. Sci*, 19, 70-3.
24. Onuigbo, N. N. J., Unuigbe, E. I. (2011). Oguijiofor. Dyslipidaemia in type 2 diabetes mellitus patient in Nnewi SOUTH-East Nigeria. *Annals of African medicine*, 10(4), 285-9.
25. Sing, G., & Kumar, A. K. (2012). A Study of Lipid Profile in Type 2 Diabetic Punjabi Population. *Journal of Exercise Science and Physiotherapy*, 8(1), 7-10.