East African Scholars Journal of Medical Sciences
Abbreviated Key Title: East African Scholars J Med Sci
ISSN: 2617-4421 (Print) & ISSN: 2617-7188 (Online)
Published By East African Scholars Publisher, Kenya

OPEN ACCESS

Volume-8 | Issue-2 | Feb-2025 | DOI: https://doi.org/10.36349/easms.2025.v08i02.007

Original Research Article

Cardiovascular Risk Factors in Newly Diagnosed Prediabetes: Insights from a Cross-Sectional Study in Bangladesh

Mohaiminul Abedin[1*], Salsa Bil Nahar[2], Tahseen Mahmood[3], Fazlul Hoque[4], Mohona Zaman[5], Mahmudul Hossain[6], Imrul-Hasan[7], Gazi Sazzad Hossain[8]

[1]Lecturer, Department of Anatomy, Abdul Malek Ukil Medical College, Noakhali, Bangladesh
[2]Assistant Professor, Abdul Malek Ukil Medical College, Noakhali, Bangladesh
[3]Consultant, Department of Endocrinology, Armed Forces Medical College, Dhaka, Bangladesh
[4]Lecturer, Department of Community Medicine, Shahid Syed Nazrul Islam Medical College, Kishoregonj, Bangladesh
[5]Associate Professor, Department of Endocrinology, Universal Medical College Hospital Ltd. Dhaka, Bangladesh
[6]Assistant professor, Department of Medicine, Kurmitola General Hospital, Dhaka, Bangladesh
[7]Emergency Medical officer, National Institute of Kidney Diseases & Urology, Dhaka
[8]Emergency Medical Officer, BIHS General Hospital, Dhaka, Bangladesh

Article History
Received: 14.01.2025
Accepted: 21.02.2025
Published: 28.02.2025

Journal homepage:
https://www.easpublisher.com

Quick Response Code

Abstract: Prediabetes is a significant metabolic disorder associated with an increased risk of cardiovascular disease (CVD). Identifying cardiovascular risk factors in individuals with prediabetes is crucial for early intervention and prevention strategies. This study aimed to assess the prevalence and distribution of cardiovascular risk factors among newly diagnosed prediabetes patients and their associations with different prediabetes subtypes. A cross-sectional study was conducted among 100 newly diagnosed prediabetes patients at a tertiary care center in Bangladesh. Prediabetes was classified into four subgroups: isolated impaired fasting glucose (IFG), isolated impaired glucose tolerance (IGT), both IFG and IGT, and isolated HbA1c-defined prediabetes, based on the American Diabetes Association (ADA) 2017 criteria. Cardiovascular risk factors, including body mass index (BMI), central obesity, hypertension, dyslipidemia, and microalbuminuria, were assessed. Statistical analyses were performed to compare risk factor prevalence among the subgroups. Dyslipidemia (98%), central obesity (90%), and metabolic syndrome (69%) were the most prevalent cardiovascular risk factors. Family history of diabetes (51%) and cardiovascular disease (33%) were also common. The IFG group exhibited the highest prevalence of dyslipidemia (100%), metabolic syndrome (85.7%), and hypertension (42.9%), though differences across subgroups were not statistically significant. A significant correlation was found between spot urinary albumin-creatinine ratio and 2-hour plasma glucose levels ($p = 0.002$). Cardiovascular risk factors are highly prevalent in prediabetes, emphasizing the need for early screening and targeted interventions to prevent disease progression and reduce future CVD burden.

Keywords: Prediabetes, Cardiovascular Risk Factors, Dyslipidemia, Metabolic Syndrome, Hypertension, Cross-Sectional Study.

Copyright © 2025 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution **4.0 International License (CC BY-NC 4.0)** which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

1. INTRODUCTION

Prediabetes represents an intermediate state of dysglycemia characterized by an increased risk of developing type 2 diabetes mellitus (T2DM) and associated complications. According to the International Diabetes Federation (IDF), the global prevalence of prediabetes is projected to rise from 318 million in 2015 to 482 million by 2040. In Bangladesh, the prevalence of prediabetes is currently estimated at 22%(*Awareness, Treatment, and Control of Diabetes in Bangladesh: A Nationwide Population-Based Study | PLOS ONE*, no date).

Prediabetes is classified into two main categories: impaired fasting glucose (IFG) and impaired glucose tolerance (IGT)(Grundy, 2012). IFG is defined as an elevated fasting plasma glucose (FPG) concentration of 5.6–6.9 mmol/L, while IGT is characterized by a 2-hour post-load plasma glucose concentration of 7.8–11.0 mmol/L following a 75-g oral glucose tolerance test (OGTT) in the presence of an FPG <7.0 mmol/L(*Impaired Fasting Glucose - an overview |*

***Corresponding Author:** Mohaiminul Abedin
Lecturer, Department of Anatomy, Abdul Malek Ukil Medical College, Noakhali, Bangladesh

ScienceDirect Topics, no date). Additionally, the American Diabetes Association (ADA) 2017 includes an HbA1c range of 5.7–6.4% as a diagnostic criterion for prediabetes (Li *et al*., 2018).

Individuals with prediabetes are at an increased risk for macrovascular complications, including cardiovascular disease (CVD) and stroke, leading to higher morbidity and mortality compared to those with normal glucose homeostasis(Schlesinger *et al.*, 2022). Research suggests that both FPG and 2-hour post-glucose (PG) levels within the prediabetic range are independent risk factors for developing atherosclerotic cardiovascular disease (ASCVD) (Kashyap *et al.*, 2023). Furthermore, evidence indicates that cardiovascular risk begins to rise well before the onset of overt diabetes, supporting the "ticking clock" hypothesis (Hu *et al.*, 2002).

The Diabetes Control and Complications Trial (DCCT) and the United Kingdom Prospective Diabetes Study (UKPDS) have demonstrated that strict glycemic control can reduce macrovascular complications(King, Peacock and Donnelly, 1999). Therefore, early screening for cardiovascular risk factors in newly diagnosed prediabetic individuals is crucial for guiding early intervention strategies. Identifying and managing these risk factors may help prevent or delay the progression of diabetes and reduce the burden of cardiovascular disease (*Diabetes*, no date).

Given these considerations, the present study aims to assess the prevalence of cardiovascular risk factors—including central obesity, hypertension, dyslipidemia, microalbuminuria, and a family history of diabetes and cardiovascular disease—in individuals with newly detected prediabetes.

2. MATERIALS AND METHODS

This cross-sectional study was conducted in the Department of Endocrinology at Bangabandhu Sheikh Mujib Medical University (BSMMU) from March 2017 to September 2018. The study included 100 adult patients with newly detected prediabetes recruited through non-probability purposive sampling. Prediabetes was diagnosed based on the American Diabetes Association (ADA) 2017 criteria, and participants were categorized into four groups: those with only impaired glucose tolerance (IGT), defined as a plasma glucose level of 7.8–11.0 mmol/L at two hours post-75g oral glucose tolerance test (OGTT) with fasting plasma glucose (FPG) less than 7.0 mmol/L; those with only impaired fasting glucose (IFG), defined as an FPG level of 5.6–6.9 mmol/L; those with both IFG and IGT; and those with only HbA1c in the prediabetes range (5.7–6.4%) with normal FPG and two-hour plasma glucose levels.

Patients taking medications that could interfere with blood glucose levels, including high-dose steroids, pentamidine, and diazoxide, or medications affecting the cardiovascular system, such as oral contraceptives, hormonal preparations, and lipid-lowering agents, were excluded. Additionally, individuals with known cardiovascular disease due to secondary causes, including familial hypercholesterolemia, nephrotic syndrome, or other endocrinopathies, were not included in the study.

Cardiovascular risk factors were assessed in all participants, including family history of diabetes and cardiovascular disease, body mass index (BMI), blood pressure, lipid profile, and urine microalbumin levels. Body weight was measured to the nearest 0.1 kg using an electronic digital weighing machine while participants wore light clothing and no shoes. Height was measured to the nearest 0.1 cm using a portable wall-mounted stadiometer, with participants standing erect, barefoot, back against the wall, and head in the Frankfurt horizontal plane. BMI was calculated by dividing weight in kilograms by height in square meters. The lipid profile was measured using the enzymatic method with a commercially available kit, while urine microalbumin levels were determined by an immunoturbidimetric assay.

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) software, version 22.0. The normality of data distribution was assessed using histograms, box-and-whisker plots, and Q-Q plots. Descriptive statistics were presented as frequencies and percentages for categorical variables, while continuous variables were expressed as mean ± standard deviation (SD). Comparisons between different prediabetes groups were performed using a one-way analysis of variance (ANOVA) for normally distributed continuous variables and the chi-square test for categorical variables.

3. RESULTS

The study included 100 adult patients newly diagnosed with prediabetes, categorized into four subgroups: isolated impaired fasting glucose (IFG), isolated impaired glucose tolerance (IGT), both IFG and IGT, and isolated HbA1c-defined prediabetes.

Table 1: Demographic and Clinical Characteristics of Study Participants by Prediabetes Subgroups

Parameters	Overall (n=100)	Only IFG (n=7)	Only IGT (n=52)	Both IFG & IGT (n=28)	Only HbA1c (n=13)
Age (years, mean ± SD)	37.46 ± 9.07	34.14 ± 7.29	37.56 ± 9.06	38.66 ± 9.58	36.23 ± 9.24
Age Group (%)					
<40 years	57 (57%)	5 (5%)	31 (31%)	13 (13%)	8 (8%)
≥40 years	43 (43%)	2 (2%)	21 (21%)	15 (15%)	5 (5%)

Parameters	Overall (n=100)	Only IFG (n=7)	Only IGT (n=52)	Both IFG & IGT (n=28)	Only HbA1c (n=13)
Sex (%)					
Male	31 (31%)	0 (0%)	17 (54.8%)	7 (22.6%)	7 (22.6%)
Female	69 (69%)	7 (10.1%)	35 (50.7%)	21 (30.4%)	6 (8.7%)
Education (%)					
Illiterate	13 (13%)	0 (0%)	8 (61.5%)	5 (38.5%)	0 (0%)
Undergraduate	59 (59%)	3 (5.1%)	34 (57.6%)	15 (25.4%)	7 (11.9%)
Graduate	28 (28%)	4 (14.3%)	10 (35.7%)	8 (28.6%)	6 (21.4%)
Occupation (%)					
Day laborer	1 (1%)	0 (0%)	1 (1%)	0 (0%)	0 (0%)
Service holder	25 (25%)	0 (0%)	12 (48%)	5 (20%)	8 (32%)
Business	10 (10%)	0 (0%)	6 (40%)	4 (40%)	0 (0%)
Housewife	55 (55%)	6 (10.9%)	28 (50.9%)	17 (30.9%)	4 (7.3%)
Others	9 (9%)	1 (11.1%)	5 (55.6%)	2 (22.2%)	1 (11.1%)
Smoking History (%)					
Non-smoker	92 (92%)	6 (6.5%)	48 (52.2%)	26 (28.3%)	12 (13%)
Quit smoking	4 (4%)	0 (0%)	2 (50%)	2 (50%)	0 (0%)
Current smoker	4 (4%)	1 (25%)	2 (50%)	0 (0%)	1 (25%)
Family History of DM (%)	51 (51%)	1 (2%)	21 (41.2%)	20 (39.2%)	9 (17.6%)
Family History of CVD (%)	33 (33%)	1 (3%)	11 (33.3%)	13 (39.4%)	8 (24.2%)

Demographic and Clinical Characteristics of Study Participants by Prediabetes Subgroups

The study population had a mean age of 37.46±9.07 years, with the highest mean age in the IFG+IGT group (38.66±9.58 years) and the lowest in the isolated IFG group (34.14±7.29 years). More than half (57%) of participants were under 40 years old, with the IFG+IGT group having the highest proportion of individuals over 40 years old (15%).

Females predominated (69%), with all isolated IFG cases being female. Males were most prevalent in the isolated IGT group (54.8%), while the IFG+IGT and isolated HbA1c groups had lower male representation (22.6% each). Educationally, 13% were illiterate, 59% had an undergraduate level, and 28% were graduates. Illiteracy was highest in the IFG+IGT group (38.5%), whereas no illiterate participants were found in the IFG or isolated HbA1c groups. The highest percentage of graduates was in the isolated HbA1c group (21.4%).

Occupationally, housewives formed the largest group (55%), followed by service holders (25%), business owners (10%), and day laborers (1%). The isolated IGT group had the highest proportion of service holders (48%), while housewives were the most common in the IFG+IGT group (30.9%). No day laborers were found in the IFG or isolated HbA1c groups.

Most participants (92%) were non-smokers, with current smoking reported in only 4%, predominantly in the isolated HbA1c group. The highest proportion of former smokers was seen in the IGT and IFG+IGT groups.

51% of participants had a family history of diabetes, particularly in the isolated IGT (41.2%) and IFG+IGT (39.2%) groups. Cardiovascular disease history was reported in 33%, with the highest prevalence in the IFG+IGT group (39.4%) and the lowest in the IFG group (3%) (Table 1).

Table 2: Frequency of Cardiovascular Risk Factors among Different Categories of Prediabetes (n=100)

Parameter	Isolated IFG (n=7)	Isolated IGT (n=52)	Both IFG & IGT (n=28)	Isolated HbA1c (n=13)	p-value
Family history of DM	1 (14.3%)	21 (40.4%)	20 (71.4%)	9 (69.2%)	**0.006**
Family history of cardiovascular disease	1 (14.3%)	11 (21.2%)	13 (46.4%)	8 (61.5%)	**0.009**
Waist circumference	7 (100%)	47 (90.4%)	25 (89.3%)	11 (84.6%)	0.748
Hypertension	3 (42.9%)	19 (36.5%)	7 (25%)	1 (7.7%)	0.170
Dyslipidemia	7 (100%)	52 (100%)	26 (92.9%)	13 (100%)	0.155
Spot urinary ACR	0 (0%)	3 (5.8%)	2 (7.1%)	0 (0%)	0.708

Frequency of Cardiovascular Risk Factors among Different Categories of Prediabetes

Significant differences were observed in the prevalence of family history of diabetes (p = 0.006) and cardiovascular disease (p = 0.009) across groups. *Both IFG & IGT* (71.4%) and *Isolated HbA1c* (69.2%) groups had the highest prevalence of familial diabetes, while *Isolated HbA1c* (61.5%) and *Both IFG & IGT* (46.4%) showed the highest rates of familial cardiovascular disease, indicating a stronger genetic predisposition in these subgroups. In contrast, *Isolated IFG* had the lowest prevalence (14.3%) for both risk factors (Table 2).

Central obesity was prevalent across all groups (84.6%–100%), though the difference was insignificant (p = 0.748). Similarly, dyslipidemia was nearly universal (92.9%–100%), with no significant variation (p = 0.155). Hypertension was more frequent in *Isolated IFG* (42.9%) and *Isolated IGT* (36.5%) but least common in *Isolated HbA1c* (7.7%) (p = 0.170), suggesting a stronger link between blood pressure abnormalities and fasting glucose alterations rather than HbA1c-defined prediabetes.

The prevalence of elevated urinary ACR was low, with the highest rates in the *IFG & IGT* (7.1%) and *Isolated IGT* (5.8%) groups, none were detected in *Isolated IFG* or *Isolated HbA1c* (p = 0.708), indicating that microvascular complications may not be an early distinguishing feature among prediabetes subtypes (Table 2).

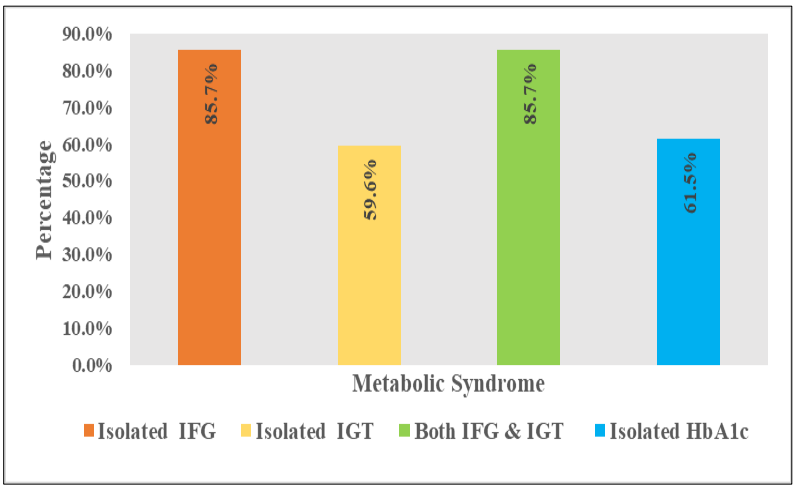

Figure 1: Frequency of Metabolic Syndrome in Different Categories of Prediabetes (n = 100)

Metabolic Syndrome in Different Categories of Prediabetes

Metabolic syndrome was most prevalent in the *Isolated IFG* and *Both IFG & IGT* groups (85.7%), while lower in *Isolated IGT* (59.6%) and *Isolated HbA1c* (61.5%). This suggests a stronger association with fasting glucose abnormalities, emphasizing the need for early intervention in these groups to reduce cardiovascular risk (Figure 1).

Table 3: Cardiovascular Risk Factors (Mean ± SD) Among Different Categories of Prediabetes (n=100)

Characteristics	Isolated IFG (n=7)	Isolated IGT (n=52)	Both IFG & IGT (n=28)	Isolated HbA1c (n=13)	p-value
BMI (kg/m²)	27.30 ± 2.77	29.17 ± 4.91	28.83 ± 5.70	27.49 ± 4.40	0.618
Waist Circumference (cm)	90.14 ± 7.81	93.86 ± 8.23	95.71 ± 12.65	92.77 ± 8.60	0.535
Systolic BP (mmHg)	138.57 ± 15.99	128.00 ± 19.05	124.46 ± 15.89	115.77 ± 110.77	0.272
Diastolic BP (mmHg)	79.29 ± 10.17	82.69 ± 12.69	78.93 ± 11.41	76.15 ± 8.69	0.252
Total Cholesterol (mg/dl)	199.14 ± 35.69	186.17 ± 33.68	190.17 ± 32.87	192.35 ± 34.86	0.763
HDL (mg/dl)	39.28±7.23	38.52±7.73	41.82±7.54	40.95±10.11	0.336
Triglycerides (mg/dl)	193.42 ± 88.21	189.53 ± 104.78	186.92 ± 84.56	205.03 ± 111.14	0.820
LDL (mg/dl)	111.86±21.07	114.79±32.67	117.22±34.23	113.16±27.85	0.969
Spot urinary ACR	8.00±3.88	12.24±11.14	13.16±11.07	8.73±5.59	0.442

Cardiovascular Risk Factors (Mean ± SD) Among Different Categories of Prediabetes

The analysis of cardiovascular risk factors among different prediabetes categories revealed no statistically significant differences, suggesting a similar pattern across the subtypes. The mean BMI was comparable across groups, ranging from 27.30 ± 2.77 in the Isolated IFG group to 29.17 ± 4.91 in the Isolated IGT group (p = 0.618). Similarly, waist circumference did not differ significantly, with values ranging from 90.14 ± 7.81 in the Isolated IFG group to 95.71 ± 12.65 in both IFG & IGT groups (p = 0.535). Blood pressure

measurements, including systolic and diastolic BP, showed no significant differences ($p = 0.272$ and $p = 0.252$, respectively), despite a trend toward lower values in the Isolated HbA1c group. Lipid profiles, including total cholesterol, HDL, triglycerides, and LDL, were also comparable across groups, with no significant variations observed ($p = 0.763$, $p = 0.336$, $p = 0.820$, and $p = 0.969$, respectively). Finally, spot urinary ACR was consistent across all groups ($p = 0.442$), further suggesting no significant differences in early kidney function markers among the prediabetes categories (Table 3).

4. DISCUSSION

This study provides a comprehensive analysis of the demographic and clinical characteristics across various prediabetes subgroups, offering insights into potential risk factors and informing targeted intervention strategies.

The mean age of participants was 37.46 ± 9.07 years, with the combined IFG and IGT group exhibiting the highest mean age (38.66 ± 9.58 years) and the isolated IFG group the lowest (34.14 ± 7.29 years). Participants in this study are younger compared to previous findings; our findings suggest that prediabetes may be affecting a younger population in our setting. This could be attributed to lifestyle changes, increasing urbanization, and earlier detection of dysglycemia (Oh *et al.*, 2020).

A notable female predominance (69%) was observed, with all isolated IFG cases being female. Conversely, males were most prevalent in the isolated IGT group (54.8%). This distribution aligns with previous research indicating potential sex-specific differences in the manifestation of prediabetes subtypes, warranting further investigation into hormonal or behavioral factors that may contribute to these disparities (Mustafa *et al.*, 2011).

Accumulating evidence suggests that individuals with nondiabetic-range hyperglycemia are already at risk for cardiovascular diseases(Levitan *et al.*, 2004). Metabolic abnormalities associated with atherosclerosis and ischemic heart disease may exist for years before diabetes manifests(Zakir *et al.*, no date). This study found a high prevalence of cardiovascular risk factors in prediabetes, particularly dyslipidemia, central obesity, and metabolic syndrome. A positive family history of cardiovascular disease was more frequent in individuals with both IFG and IGT. Among prediabetes categories, the IFG group had the highest percentage of dyslipidemia, central obesity, metabolic syndrome, and hypertension. A significant positive correlation was observed between spot urinary albumin-creatinine ratio and 2-hour plasma glucose.

Dyslipidemia was highly prevalent (98%), with all prediabetes groups showing altered lipid levels. Obesity was also common, with 38% overweight 54% obese, and 90% exhibiting central obesity. The high rate of central obesity among Bangladeshis may reflect differences in body composition compared to other populations(Ali *et al.*, 2022). Lifestyle factors such as urbanization, reduced physical activity, and increased food consumption may contribute(Assah *et al.*, 2011). Central adiposity is closely linked to insulin resistance and increased cardiovascular risk(Kahn and Flier, 2000; Anand *et al.*, 2015).

Metabolic syndrome prevalence (69%) was comparable to other studies, supporting evidence that prediabetes is associated with insulin resistance and increased ASCVD risk (Kalan Farmanfarma *et al.*, 2019; Kashyap *et al.*, 2023). Hypertension was present in 30% of participants, with a higher incidence in males. Although lower than in other studies, this could be due to a younger study population with fewer comorbidities(Huang *et al.*, 2020).

A strong familial link was observed, with 51% of prediabetes patients having a first-degree family history of diabetes and 33% having a family history of cardiovascular disease. Family history has been recognized as a key risk factor in guidelines by major health organizations, emphasizing its role in early intervention(Sanghavi *et al.*, 2019). Only 5% of participants had microalbuminuria, consistent with previous studies highlighting its role in cardiovascular risk(Ärnlöv and Nowak, 2020).

Despite the presence of cardiovascular risk factors, only 9% had a moderate and 1% had a high 10-year cardiovascular risk. The lower prevalence of high-risk may be due to the younger age and non-smoking status of most participants. The IFG+IGT group had a significantly higher rate of positive family history of diabetes and cardiovascular disease, which aligns with a previous study (Nathan *et al.*, 2007), suggesting a combined impact of insulin resistance and β-cell dysfunction.

While there were no significant differences in cardiovascular risk among prediabetes categories, the IFG group had the highest rates of dyslipidemia, metabolic syndrome, and central obesity. This aligns with previous studies linking central obesity with visceral adiposity and insulin resistance(Westphal, 2008; *Association between prediabetes and risk of cardiovascular disease and all cause mortality: systematic review and meta-analysis | The BMJ*, no date). However, prediabetes was not a predictor of cardiovascular risk in this study, possibly due to the small sample size and lack of cardiovascular outcome assessment. Large-scale meta-analyses have shown a clear association between prediabetes and cardiovascular events(Nanavaty *et al.*, 2023), highlighting the need for early intervention.

These findings underscore the heterogeneity within prediabetes subgroups concerning demographic and clinical characteristics. Understanding these differences is essential for developing tailored intervention strategies to prevent the progression of type 2 diabetes. Further research is warranted to explore the underlying mechanisms driving these variations and to assess the effectiveness of targeted interventions in diverse populations.

5. CONCLUSION

This study highlights the high prevalence of cardiovascular risk factors among individuals with newly detected prediabetes. Key risk factors such as hypertension, dyslipidemia, obesity, and elevated inflammatory markers, were significantly associated with prediabetes, underscoring the need for early intervention. Given the potential progression to type 2 diabetes and increased cardiovascular morbidity, targeted lifestyle modifications and risk factor management should be prioritized. Strengthening preventive strategies, including regular screening and patient education, may help mitigate cardiovascular risks in this high-risk population.

REFERENCE

- Ali, N. (2022). 'Prevalence and risk factors of general and abdominal obesity and hypertension in rural and urban residents in Bangladesh: a cross-sectional study', *BMC Public Health*, *22*(1), 1707. https://doi.org/10.1186/s12889-022-14087-8.
- Anand, S. S. (2015). 'Food Consumption and its impact on Cardiovascular Disease: Importance of Solutions focused on the globalized food system', *Journal of the American College of Cardiology*, *66*(14), 1590–1614. Available at: https://doi.org/10.1016/j.jacc.2015.07.050.
- Ärnlöv, J., & Nowak, C. (2020) 'Association between albuminuria, incident cardiovascular events, and mortality in persons without hypertension, diabetes, and cardiovascular disease', *European Journal of Preventive Cardiology*, *29*(1), e4–e6. Available at: https://doi.org/10.1093/eurjpc/zwaa095.
- Assah, F. K. (2011) 'Urbanization, Physical Activity, and Metabolic Health in Sub-Saharan Africa', *Diabetes Care*, *34*(2), 491–496. Available at: https://doi.org/10.2337/dc10-0990.
- *Association between prediabetes and risk of cardiovascular disease and all cause mortality: systematic review and meta-analysis | The BMJ* (no date). Available at: https://www.bmj.com/content/355/bmj.i5953 (Accessed: 31 January 2025).
- *Awareness, Treatment, and Control of Diabetes in Bangladesh: A Nationwide Population-Based Study | PLOS ONE* (no date). Available at: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0118365 (Accessed: 31 January 2025).
- *Diabetes* (no date). Available at: https://www.who.int/news-room/fact-sheets/detail/diabetes (Accessed: 31 January 2025).
- Grundy, S. M. (2012). 'Pre-Diabetes, Metabolic Syndrome, and Cardiovascular Risk', *Journal of the American College of Cardiology*, *59*(7), 635–643. Available at: https://doi.org/10.1016/j.jacc.2011.08.080.
- Hu, F.B. 2002) 'Elevated Risk of Cardiovascular Disease Prior to Clinical Diagnosis of Type 2 Diabetes', *Diabetes Care*, *25*(7), 1129–1134. Available at: https://doi.org/10.2337/diacare.25.7.1129.
- Huang, Y. Q. (2020) 'Prediabetes and risk for all-cause and cardiovascular mortality based on hypertension status', *Annals of Translational Medicine*, *8*(23), 1580. Available at: https://doi.org/10.21037/atm-20-1155.
- *Impaired Fasting Glucose - an overview | ScienceDirect Topics* (no date). Available at: https://www.sciencedirect.com/topics/medicine-and-dentistry/impaired-fasting-glucose (Accessed: 31 January 2025).
- Kahn, B. B., & Flier, J. S. (2000). 'Obesity and insulin resistance', *Journal of Clinical Investigation*, *106*(4), 473–481.
- Kalan Farmanfarma, K. (2019) 'Prevalence of metabolic syndrome in Iran: A meta-analysis of 69 studies', *Diabetes & Metabolic Syndrome*, *13*(1), 792–799. Available at: https://doi.org/10.1016/j.dsx.2018.11.055.
- Kashyap, S. R. (2023) 'Glycemic and metabolic sub-classification of prediabetes and risk factors for cardiovascular disease in the D2d cohort', *American Journal of Preventive Cardiology*, *15*, 100525. Available at: https://doi.org/10.1016/j.ajpc.2023.100525.
- King, P., Peacock, I., & Donnelly, R. (1999). 'The UK Prospective Diabetes Study (UKPDS): clinical and therapeutic implications for type 2 diabetes', *British Journal of Clinical Pharmacology*, *48*(5), 643–648. Available at: https://doi.org/10.1046/j.1365-2125.1999.00092.x.
- Levitan, E. B. (2004). 'Is nondiabetic hyperglycemia a risk factor for cardiovascular disease? A meta-analysis of prospective studies', *Archives of Internal Medicine*, *164*(19), 2147–2155. https://doi.org/10.1001/archinte.164.19.2147.
- Li, G. (2018). 'Evaluation of ADA HbA1c criteria in the diagnosis of pre-diabetes and diabetes in a population of Chinese adolescents and young adults at high risk for diabetes: a cross-sectional study', *BMJ Open*, *8*(8), e020665. Available at: https://doi.org/10.1136/bmjopen-2017-020665.
- Mustafa, N. (2011) 'Prevalence of Abnormal Glucose Tolerance and Risk Factors in Urban and

Rural Malaysia', *Diabetes Care*, *34*(6), 1362–1364. Available at: https://doi.org/10.2337/dc11-0005.

- Nanavaty, D. (2023) 'Prediabetes is an incremental risk factor for adverse cardiac events: A nationwide analysis', *Atherosclerosis Plus*, *54*, 22–26. Available at: https://doi.org/10.1016/j.athplu.2023.08.002.
- Nathan, D. M. (2007). 'Impaired Fasting Glucose and Impaired Glucose Tolerance: Implications for care', *Diabetes Care*, *30*(3), 753–759. Available at: https://doi.org/10.2337/dc07-9920.
- Oh, M. R. (2020). 'Clinical Characteristics and Associated Risk Factors of Prediabetes in the Southwestern Region of Korea from 2010–2019', *Journal of Clinical Medicine*, *9*(4), 1114. Available at: https://doi.org/10.3390/jcm9041114.
- Sanghavi, K. (2019) 'Family health history and genetic services—the East Baltimore community stakeholder interview project', *Journal of Community Genetics*, *10*(2219–227. Available at: https://doi.org/10.1007/s12687-018-0379-z.
- Schlesinger, S. (2022). 'Prediabetes and risk of mortality, diabetes-related complications and comorbidities: umbrella review of meta-analyses of prospective studies', *Diabetologia*, *65*(2), 275–285. Available at: https://doi.org/10.1007/s00125-021-05592-3.
- Westphal, S. A. (2008). 'Obesity, Abdominal Obesity, and Insulin Resistance', *Clinical Cornerstone*, *9*(1), 23–31. Available at: https://doi.org/10.1016/S1098-3597(08)60025-3.
- Zakir, M. (no date) 'Cardiovascular Complications of Diabetes: From Microvascular to Macrovascular Pathways', *Cureus*, *15*(9), e45835. Available at: https://doi.org/10.7759/cureus.45835.

Cite This Article: Mohaiminul Abedin, Salsa Bil Nahar, Tahseen Mahmood, Fazlul hoque, Mohona Zaman, Mahmudul Hossain, Imrul-Hasan, Gazi Sazzad Hossain (2025). Cardiovascular Risk Factors in Newly Diagnosed Prediabetes: Insights from a Cross-Sectional Study in Bangladesh. *East African Scholars J Med Sci*, *8*(2), 85-91.