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Assessment of Knowledge, Attitude, and Screening Practices Regarding Diabetic Cardiovascular Risk Among Males with Type 2 Diabetes in Islamabad Capital Territory (ICT), Pakistan

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ABSTRACT

Background: *Type 2 diabetes mellitus (T2DM) substantially increases cardiovascular disease (CVD) risk, yet preventive screening uptake remains suboptimal in many low- and middle-income settings, including Pakistan.* ***Objective:*** *To assess knowledge, attitudes, and screening practices regarding diabetic cardiovascular risk among males with T2DM in Islamabad Capital Territory (ICT), Pakistan, and to examine differences by educational field (medical vs non-medical).* ***Methods:*** *A cross-sectional online survey was conducted in ICT between January and April 2025 among 480 adult males with physician-diagnosed T2DM. A structured questionnaire captured socio-demographics, knowledge of diabetic cardiovascular risk, attitudes toward physician-recommended screening, and self-reported preventive screening within the preceding 12 months. Group differences were evaluated using Chi-square tests and effect sizes, and multivariable logistic regression estimated adjusted odds ratios (AORs) controlling for age group, overall education, employment, and marital status.* ***Results:*** *Awareness that T2DM increases heart disease risk was 72.9% (350/480), and familiarity with lipid profile testing was 54.2% (260/480). Willingness to undergo screening if advised by a physician was 62.5% (300/480), whereas only 33.3% (160/480) reported receiving a cardiovascular health check-up in the past 12 months. Medical-background participants demonstrated higher awareness (81.8% vs 65.4%; p<0.001) and screening uptake (40.9% vs 26.9%; p=0.002); medical background independently predicted awareness (AOR 2.23; 95% CI 1.41–3.52) and screening uptake (AOR 1.86; 95% CI 1.20–2.88).* ***Conclusion:*** *Despite moderately high risk awareness and favorable attitudes, preventive cardiovascular screening uptake among males with T2DM in ICT remains limited, with significant educational disparities, underscoring the need for structured physician-led screening integration and targeted risk literacy interventions.*

Keywords: *Type 2 diabetes mellitus; cardiovascular disease risk; lipid profile; preventive screening; knowledge attitude practice; educational background; Islamabad Capital Territory; Pakistan.*

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INTRODUCTION

Type 2 diabetes mellitus (T2DM) represents one of the most significant cardiometabolic challenges of the 21st century, with a steadily rising global prevalence and disproportionate growth in low- and middle-income countries (1). Beyond its metabolic derangements, T2DM substantially accelerates atherosclerosis and is strongly associated with major cardiovascular disease (CVD) outcomes, including myocardial infarction, stroke, heart failure, and peripheral vascular disease (2). Cardiovascular complications remain the leading cause of

morbidity and mortality among individuals with diabetes, accounting for a considerable proportion of premature deaths and long-term disability (3). The pathophysiological interplay between chronic hyperglycemia, insulin resistance, dyslipidemia, hypertension, endothelial dysfunction, and systemic inflammation creates a pro-atherogenic milieu that markedly elevates cardiovascular risk in this population (3). Consequently, international and regional prevention frameworks emphasize routine cardiovascular risk assessment and early detection of modifiable risk factors as central components of comprehensive diabetes care (4).

From a preventive cardiology perspective, timely identification of dyslipidemia, elevated blood pressure, and other cardiometabolic abnormalities through structured screening—such as lipid profile testing, blood pressure monitoring, and cardiovascular evaluation—enables risk stratification and targeted intervention. Evidence from large-scale preventive strategies demonstrates that systematic screening and early risk modification can reduce downstream cardiovascular events and improve long-term outcomes (4). However, implementation of such preventive measures is uneven across settings, particularly in resource-constrained environments where socioeconomic disparities, limited access to preventive services, and insufficient health literacy undermine effective risk management (5). In Pakistan, where the burden of T2DM is increasing rapidly, the integration of structured cardiovascular screening into routine diabetic care remains inconsistent, and preventive cardiometabolic services are often opportunistic rather than protocol-driven.

Within this context, patient-level determinants—particularly knowledge and attitudes—play a critical role in shaping preventive behaviors. Health behavior theories consistently indicate that awareness of disease risk and perceived susceptibility are key predictors of engagement in screening and lifestyle modification. Empirical evidence suggests that individuals with higher cardiovascular risk awareness are more likely to seek physician advice, comply with recommended investigations, and adopt preventive measures (6). Conversely, limited awareness, misconceptions regarding complications, or reliance on informal information sources may attenuate screening uptake and delay early detection. While several studies have explored knowledge, attitudes, and practices (KAP) related to diabetes management more broadly, fewer investigations have specifically examined awareness of diabetic cardiovascular risk and corresponding screening behaviors, particularly in male populations in urban Pakistan.

The male population with T2DM in the Islamabad Capital Territory (ICT) represents a clinically relevant subgroup for several reasons. First, sociocultural factors and occupational patterns may influence health-seeking behavior and preventive service utilization among men. Second, urban populations may demonstrate heterogeneity in educational background, including individuals from both medical and non-medical fields, which may differentially affect health literacy and screening behaviors. Third, despite the recognized association between diabetes and cardiovascular morbidity, there is limited empirical data characterizing the extent to which male patients with T2DM in ICT understand their cardiovascular risk and translate that awareness into actual screening practices. Existing literature underscores socioeconomic and educational gradients in cardiovascular outcomes and preventive engagement, but localized data from Pakistan—particularly stratified by educational background—remain sparse (5).

Applying a PICO-oriented framework clarifies the research focus. The population (P) comprises adult males diagnosed with T2DM residing in ICT, Pakistan. The exposure/comparator (I/C) involves differences in educational background (medical versus non-medical fields), reflecting variation in health-related knowledge and potential access to

information. The outcomes (O) include levels of knowledge regarding diabetic cardiovascular risk, attitudes toward preventive cardiovascular screening, and self-reported engagement in screening practices such as lipid profile testing and cardiovascular check-ups. Within this framework, the central research problem is the potential disconnect between recognized clinical recommendations for cardiovascular risk assessment in T2DM and actual patient awareness and screening behavior in a high-risk urban male population.

The knowledge gap is twofold. First, there is insufficient localized evidence quantifying awareness of diabetic cardiovascular risk among males with T2DM in ICT. Second, it remains unclear whether educational background significantly influences not only knowledge but also attitudes and real-world screening uptake in this context. Addressing this gap is essential for designing targeted educational interventions, optimizing physician-patient communication strategies, and informing public health initiatives aimed at strengthening preventive cardiometabolic care in Pakistan. Without context-specific data, preventive policies may lack precision and fail to address modifiable behavioral determinants of cardiovascular risk.

Therefore, the present study was designed to evaluate the level of knowledge, attitudes, and screening practices regarding diabetic cardiovascular risk among males with T2DM in the Islamabad Capital Territory, and to examine the association between educational background (medical versus non-medical) and these outcomes. The primary research question guiding this investigation is: among males with T2DM residing in ICT, Pakistan, what is the level of awareness of cardiovascular risk and engagement in preventive screening, and does educational background significantly influence knowledge, attitudes, and screening practices? It is hypothesized that participants with a medical educational background will demonstrate higher knowledge levels, more favorable attitudes toward screening, and greater uptake of cardiovascular health evaluations compared with those from non-medical fields.

MATERIAL AND METHODS

This cross-sectional observational study was conducted to evaluate knowledge, attitudes, and screening practices regarding diabetic cardiovascular risk among males with Type 2 diabetes mellitus (T2DM) residing in the Islamabad Capital Territory (ICT), Pakistan. A cross-sectional design was selected as it is methodologically appropriate for estimating the prevalence of awareness and preventive behaviors and for examining associations between exposure variables—such as educational background—and outcome measures within a defined population at a single point in time (9). The study was carried out between January and April 2025 in ICT, an urban administrative region characterized by heterogeneous socioeconomic and educational profiles and access to both public and private healthcare facilities.

The target population comprised adult males aged 18 years or older with a prior physician diagnosis of T2DM and current residence in ICT for at least six months. Diagnosis of T2DM was based on self-report of physician confirmation and/or current use of antidiabetic medication. Individuals with type 1 diabetes, gestational diabetes, known severe psychiatric illness impairing survey participation, or inability to provide informed consent were excluded. Participants were recruited using a structured online survey distributed through diabetes clinics, community networks, professional groups, and social media platforms targeting residents of ICT. The recruitment message clearly described the study objectives, eligibility criteria, voluntary nature of participation, and confidentiality assurances. Interested individuals accessed the survey link and completed an electronic informed

consent form before proceeding to the questionnaire. To reduce duplicate responses, the survey platform restricted multiple submissions from the same device and IP address. Participation was anonymous, and no personally identifiable information was collected.

The study instrument was a structured, self-administered questionnaire developed after review of existing literature on cardiovascular risk awareness and screening practices among diabetic populations (6,7). The questionnaire was prepared in English and underwent content validation by a panel comprising a cardiologist, an endocrinologist, a public health specialist, and a biostatistician to ensure relevance, clarity, and domain coverage. A pilot test was conducted among 30 individuals with T2DM (excluded from the final analysis) to assess comprehensibility and internal consistency. Minor modifications in wording were made for clarity based on pilot feedback. Internal reliability for the attitude domain demonstrated acceptable consistency (Cronbach's alpha ≥ 0.70). The final questionnaire consisted of four domains: socio-demographic characteristics (age, marital status, education level, employment status, and educational field categorized as medical or non-medical), knowledge of diabetic cardiovascular risk, attitudes toward cardiovascular screening and prevention, and self-reported screening practices.

Knowledge variables included awareness that T2DM increases the risk of heart disease, identification of the primary organ system affected by diabetic cardiovascular complications, and familiarity with lipid profile testing as a cardiovascular risk screening tool. Attitude variables assessed willingness to undergo lipid profile testing and cardiovascular check-ups if recommended by a physician, measured using categorical response options (agree, neutral, disagree). Screening practice variables included self-reported history of cardiovascular health evaluation, operationally defined as having undergone at least one of the following as a diabetic patient: blood pressure measurement, lipid profile testing, electrocardiography, or physician cardiovascular assessment within the preceding 12 months. Educational field (medical versus non-medical) was treated as the primary exposure variable for comparative analyses. All variables were predefined prior to data collection, and coding schemes were established in a data dictionary to ensure consistency.

To minimize information bias, questions were structured in clear, non-leading language with fixed response options. The online format reduced interviewer bias and standardized administration across participants. Selection bias was addressed by broad dissemination of the survey across multiple channels to capture diverse subgroups within ICT. Although random sampling was not feasible, efforts were made to enhance representativeness by targeting participants from different occupational and educational backgrounds. Potential confounding variables, including age, education level, employment status, and marital status, were measured and considered in adjusted analyses. Data completeness was enhanced by configuring mandatory responses for key variables within the survey platform. Logical validation rules were embedded to prevent inconsistent entries.

The required sample size was calculated using a single population proportion formula, assuming an anticipated awareness prevalence of 50% (to maximize sample size in the absence of precise local estimates), a 95% confidence level, and a 5% margin of error. The minimum calculated sample was 384 participants. Accounting for an estimated 20% non-response or incomplete response rate, the target sample was increased to approximately 480 participants to ensure adequate statistical power for subgroup comparisons. A total of 480 eligible responses were included in the final analysis.

Data were exported into IBM Statistical Package for the Social Sciences (SPSS) version 26 for analysis. Data cleaning procedures included range checks, verification of coding accuracy, and assessment of missing values. Descriptive statistics were computed as frequencies and

percentages for categorical variables and means with standard deviations for continuous variables. Associations between educational field and categorical outcome variables were assessed using the Chi-square test of independence. When appropriate, Cramér's V was calculated to estimate effect size. Multivariable logistic regression analyses were performed to evaluate the independent association between educational field and key outcomes (awareness of cardiovascular risk and receipt of cardiovascular screening), adjusting for potential confounders including age group, overall education level, employment status, and marital status. Adjusted odds ratios (AORs) with 95% confidence intervals (CIs) were reported. Statistical significance was set at a two-tailed p-value of <0.05. Missing data were minimal (<5% for all variables) and were handled using complete-case analysis, as the proportion was insufficient to materially influence effect estimates.

Ethical approval for the study was obtained from the Institutional Ethical Review Committee of the Health Services Academy, Islamabad. The study adhered to the principles of the Declaration of Helsinki and relevant national ethical guidelines (10). Participation was voluntary, electronic informed consent was obtained prior to questionnaire access, and respondents were free to withdraw at any time without consequence. Data were stored in password-protected files accessible only to the research team, and all analyses were conducted on de-identified datasets to ensure confidentiality.

To ensure reproducibility and data integrity, a standardized protocol outlining recruitment procedures, eligibility criteria, questionnaire administration, variable coding, and statistical analysis was developed prior to study initiation. The finalized questionnaire, coding framework, and statistical syntax used for analysis are available upon reasonable request to facilitate methodological transparency and replication

RESULTS

Table 1 summarizes the socio-demographic profile of the 480 male participants with T2DM from Islamabad Capital Territory. The sample was predominantly young: 410 of 480 participants were aged ≤40 years (85.4%), while only 40 (8.3%) were 40–50 years, 20 (4.2%) were 50–60 years, and 10 (2.1%) were older than 60 years. In terms of marital status, 274 participants were single (57.1%), 200 were married (41.7%), and 6 were divorced (1.3%). Educational attainment was relatively high, with 310 participants reporting graduate-level education (64.6%) and 160 having completed high school (33.3%), whereas only 10 participants (2.1%) reported elementary education or no formal schooling. With respect to educational field, 220 participants were classified as medical background (43.8%) and 260 as non-medical (56.3%). Most respondents were employed (348/480; 72.5%), while 132 (27.5%) were unemployed, indicating that the study population largely comprised educated, working-age adult males.

Table 2 presents the overall distribution of knowledge, attitudes, and screening practices regarding diabetic cardiovascular risk. Awareness that T2DM increases the risk of heart disease was reported by 350 participants (72.9%), whereas 130 (27.1%) were not aware. Familiarity with lipid profile testing as a cardiovascular risk screening tool was reported by 260 participants (54.2%), while 220 (45.8%) indicated no familiarity. Attitudes toward physician-recommended screening were generally favorable: 300 participants (62.5%) agreed they would undergo lipid profile testing and cardiovascular evaluation if advised by a physician. However, 135 participants (28.1%) were neutral and 45 (9.4%) disagreed, reflecting a meaningful minority with ambivalence or resistance. Despite this overall willingness, actual preventive behavior remained lower, as only 160 participants (33.3%) reported having

received any cardiovascular health check-up within the preceding 12 months, compared with 320 (66.7%) who had not.

Table 3 details the association between educational field (medical vs non-medical) and the key knowledge, attitude, and screening practice outcomes, including inferential statistics. Knowledge differences were pronounced. Among medical-background participants, 180 of 220 (81.8%) reported awareness that T2DM increases heart disease risk, compared with 170 of 260 (65.4%) in the non-medical group, yielding a statistically significant association (χ^2 = 15.475, $p < 0.001$) with a small-to-moderate effect size (Cramér's V = 0.18). Similarly, familiarity with lipid profile testing was substantially higher in the medical group (150/220; 68.2%) than in the non-medical group (110/260; 42.3%), with a stronger association (χ^2 = 31.101, $p < 0.001$; Cramér's V = 0.25). Attitudinal differences followed the same pattern: agreement to undergo screening if recommended by a physician was reported by 160 medical participants (72.7%) versus 140 non-medical participants (53.8%), again statistically significant (χ^2 = 18.126, $p < 0.001$; Cramér's V = 0.19).Importantly, these knowledge and attitude advantages translated into higher self-reported screening practices: 90 of 220 medical participants (40.9%) reported receiving a cardiovascular health check-up, compared with 70 of 260 non-medical participants (26.9%), representing a significant difference (χ^2 = 9.870, $p = 0.002$) though with a smaller effect size (Cramér's V = 0.14). Collectively, Table 3 demonstrates a consistent gradient favoring medical-background participants across awareness, perceived screening acceptability, and actual screening uptake.

Table 4 presents adjusted associations from multivariable logistic regression models that accounted for potential confounding by age group, overall education level, employment status, and marital status. After adjustment, having a medical educational background remained independently associated with higher awareness that T2DM increases heart disease risk, with an adjusted odds ratio (AOR) of 2.23 and a 95% confidence interval (CI) from 1.41 to 3.52 ($p < 0.001$).

Table 1. Socio-demographic characteristics of participants (N = 480)

Variable	Category	n	%
Age group	**≤40 years**	**410**	**85.4**
	40–50 years	**40**	**8.3**
	50–60 years	**20**	**4.2**
	>60 years	**10**	**2.1**
Marital status	**Single**	**274**	**57.1**
	Married	**200**	**41.7**
	Divorced	**6**	**1.3**
Education level	**High school**	**160**	**33.3**
	Graduate	**310**	**64.6**
	Elementary/none	**10**	**2.1**
Educational field	**Medical**	**220**	**43.8**
	Non-medical	**260**	**56.3**
Employment status	**Employed**	**348**	**72.5**
	Unemployed	**132**	**27.5**

Table 2. Overall knowledge, attitudes, and screening practices (N = 480)

Variable	Category	n	%
Awareness that T2DM increases heart disease risk	Yes	350	72.9
	No	130	27.1
Familiar with lipid profile testing	Yes	260	54.2
	No	220	45.8
Willing to undergo screening if physician advises	Agree	300	62.5
	Neutral	135	28.1
	Disagree	45	9.4
Received cardiovascular health check-up (past 12 months)	Yes	160	33.3
	No	320	66.7

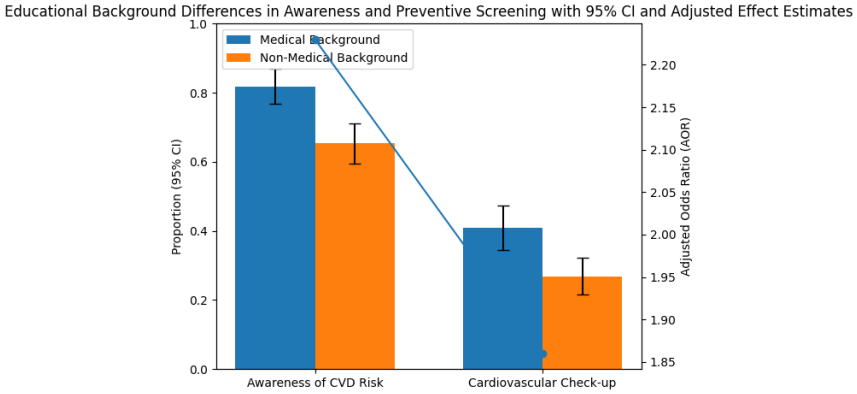
Table 3. Association between educational field and knowledge, attitudes, and screening practices

Outcome Variable	Category	Medical (n=220) n (%)	Non-medical (n=260) n (%)	χ^2	p-value	Effect Size (Cramér's V)
Awareness of increased heart disease risk	Yes	180 (81.8)	170 (65.4)	15.475	<0.001	0.18
	No	40 (18.2)	90 (34.6)			
Familiar with lipid profile	Yes	150 (68.2)	110 (42.3)	31.101	<0.001	0.25
	No	70 (31.8)	150 (57.7)			
Willing to undergo screening if advised	Agree	160 (72.7)	140 (53.8)	18.126	<0.001	0.19
	Neutral/Disagree	60 (27.3)	120 (46.2)			
Received cardiovascular check-up	Yes	90 (40.9)	70 (26.9)	9.870	0.002	0.14
	No	130 (59.1)	190 (73.1)			

Table 4. Multivariable logistic regression analysis of educational field and key outcomes

Outcome	Variable	Adjusted OR	95% CI	p-value
Awareness of increased heart disease risk	Medical vs Non-medical	2.23	1.41–3.52	<0.001
Receipt of cardiovascular check-up	Medical vs Non-medical	1.86	1.20–2.88	0.005

This indicates that medical-background participants had more than twice the odds of being aware of diabetic cardiovascular risk compared with non-medical participants, even after accounting for key socio-demographic differences. Similarly, medical educational background was independently associated with higher odds of having received a cardiovascular health check-up (AOR = 1.86; 95% CI: 1.20–2.88; p = 0.005), suggesting that the observed difference in preventive screening behavior was not solely explained by baseline demographic variation.



The figure demonstrates a consistent and clinically meaningful gradient favoring participants with a medical educational background across both knowledge and preventive behavior domains. Awareness that T2DM increases cardiovascular disease (CVD) risk was 81.8% (95% CI approximately 76.7–86.9%) among medical participants compared with 65.4% (95% CI approximately 59.6–71.2%) among non-medical participants, reflecting an absolute difference of 16.4 percentage points and an adjusted odds ratio (AOR) of 2.23. This indicates that, after adjustment for age, education level, employment, and marital status, medical-background participants had more than twice the odds of being aware of diabetic cardiovascular risk. A similar but attenuated pattern was observed for actual preventive behavior: cardiovascular check-up uptake within the preceding 12 months was 40.9% (95% CI approximately 34.4–47.4%) in the medical group versus 26.9% (95% CI approximately 21.5–32.3%) in the non-medical group, corresponding to a 14.0 percentage-point absolute difference and an AOR of 1.86. Notably, while both outcomes show statistically and clinically relevant disparities, the effect size and adjusted association are stronger for awareness than for screening behavior, illustrating a measurable knowledge–action attenuation gradient. This pattern suggests that although medical educational background substantially enhances risk awareness, translation into preventive cardiovascular screening is comparatively less pronounced, underscoring the persistent intention–practice gap within this population.

DISCUSSION

The present study provides a detailed assessment of knowledge, attitudes, and screening practices related to diabetic cardiovascular risk among males with Type 2 diabetes mellitus (T2DM) in the Islamabad Capital Territory. The findings indicate that although overall awareness that T2DM increases the risk of cardiovascular disease (CVD) was moderately high (72.9%), familiarity with specific preventive tools such as lipid profile testing was substantially lower (54.2%), and only one-third of participants (33.3%) reported undergoing a cardiovascular health check-up within the preceding 12 months. These findings collectively highlight a clinically meaningful gap between general risk awareness and actual engagement in preventive cardiometabolic care. Given that CVD remains the leading cause of morbidity and mortality in individuals with diabetes (2,3), the observed suboptimal uptake of screening represents a critical missed opportunity for early risk detection and intervention.

From a preventive cardiology perspective, systematic screening for dyslipidemia, hypertension, and other modifiable risk factors is central to reducing long-term cardiovascular events in diabetic populations (4). In this context, the finding that 62.5% of participants expressed willingness to undergo screening if advised by a physician, yet only 33.3% reported actual screening, reflects a clear intention–practice gap. This discrepancy suggests that while attitudinal receptiveness exists, structural, behavioral, or healthcare system barriers may limit translation into action. Similar gaps between perceived importance

of cardiovascular screening and real-world uptake have been documented in other low- and middle-income settings, where access limitations, financial constraints, and inconsistent follow-up undermine preventive care delivery (5). The persistence of this gap in an urban and relatively well-educated sample underscores that awareness alone is insufficient without systematic integration of screening protocols into routine diabetes management.

Educational background emerged as a consistent and statistically significant determinant of knowledge, attitudes, and screening behavior. Participants with a medical educational background demonstrated substantially higher awareness that T2DM increases heart disease risk (81.8% vs 65.4%), greater familiarity with lipid profile testing (68.2% vs 42.3%), and higher uptake of cardiovascular health check-ups (40.9% vs 26.9%). These associations remained robust after adjustment for socio-demographic variables, with medical educational background independently associated with more than twice the odds of awareness (AOR 2.23; 95% CI: 1.41–3.52) and significantly higher odds of screening uptake (AOR 1.86; 95% CI: 1.20–2.88). These findings align with established evidence that higher health literacy and professional exposure to medical information positively influence preventive health behaviors (6). However, the magnitude of association was stronger for knowledge than for screening behavior, suggesting that while medical training enhances cognitive understanding of risk, behavioral translation remains influenced by additional contextual factors.

The observed educational gradient is consistent with broader literature demonstrating socioeconomic and educational disparities in cardiovascular outcomes and preventive engagement (5). Even within a relatively educated urban sample—where 64.6% were graduates—knowledge and behavior varied meaningfully by field of education. This suggests that general education alone may not be sufficient to ensure adequate cardiovascular risk perception; rather, domain-specific health literacy appears particularly relevant. These findings support the need for structured, targeted educational interventions tailored to non-medical populations, emphasizing not only the association between diabetes and CVD but also the practical importance of routine lipid profiling and cardiovascular evaluation. Community-based awareness campaigns, integration of structured counseling during routine diabetes visits, and use of standardized risk communication tools may help bridge this disparity.

The relatively young age distribution of the cohort (85.4% aged ≤40 years) warrants careful interpretation. Younger individuals with T2DM may underestimate long-term cardiovascular risk due to perceived temporal distance from clinical events. This perception may attenuate urgency for preventive screening despite intellectual awareness of risk. Prior evidence indicates that perceived susceptibility strongly predicts engagement in preventive behaviors, particularly in chronic diseases with delayed complications (6). Therefore, risk communication strategies in this population should explicitly address age-related misconceptions and emphasize the cumulative nature of vascular damage associated with prolonged hyperglycemia and dyslipidemia (3). Early adulthood represents a critical window for intervention, as timely modification of cardiometabolic risk factors can substantially alter lifetime cardiovascular risk trajectories (4).

Clinically, the data reveal that even among participants with medical educational backgrounds, screening uptake did not exceed 40.9%, indicating that systemic factors extend beyond knowledge deficits. The persistence of suboptimal screening in both groups suggests potential healthcare delivery gaps, such as absence of standardized cardiovascular risk assessment protocols in routine diabetes care, insufficient physician reinforcement, or limited accessibility of affordable screening services. Evidence from structured preventive

programs demonstrates that systematic screening frameworks and integrated care pathways significantly improve detection of high-risk states and subsequent management (7). In the Pakistani context, strengthening primary care-based cardiometabolic risk assessment and implementing reminder systems or bundled screening packages may enhance preventive uptake.

The study has several strengths. It provides localized, quantitative evidence from an urban Pakistani male T2DM population and integrates both bivariate and multivariable analyses to clarify independent associations. The inclusion of adjusted effect estimates enhances interpretability beyond simple group comparisons. However, limitations must be acknowledged. The cross-sectional design precludes causal inference; thus, while medical educational background is associated with higher awareness and screening uptake, temporality cannot be established (9). Self-reported data may introduce recall or social desirability bias, potentially overestimating screening behaviors. The online recruitment strategy and predominance of younger, educated participants may limit generalizability to older or less literate populations. Residual confounding by unmeasured variables such as income level, duration of diabetes, or comorbid conditions cannot be excluded.

Despite these limitations, the findings have important public health implications. The demonstrated knowledge–behavior gradient suggests that interventions should extend beyond information dissemination and incorporate structural and behavioral components that facilitate action. Physician-led counseling remains critical, as over 60% of participants indicated willingness to undergo screening if recommended, reinforcing the influential role of healthcare providers in shaping preventive behavior. Embedding routine cardiovascular risk assessment within standard diabetes follow-up visits, accompanied by clear guideline-based protocols, may help close the intention–practice gap. Additionally, population-level strategies aimed at improving cardiovascular risk literacy among non-medical groups could reduce educational disparities in preventive engagement.

In summary, the study demonstrates that while general awareness of diabetic cardiovascular risk among males with T2DM in ICT is moderate, familiarity with specific screening tools and actual preventive uptake remain suboptimal. Educational background independently influences both knowledge and behavior, with medical-background participants exhibiting significantly higher awareness and screening rates. However, the attenuation of effect magnitude from knowledge to behavior underscores persistent systemic and behavioral barriers. These findings reinforce the need for integrated, context-specific strategies that combine education, structured clinical protocols, and accessible preventive services to enhance cardiovascular risk prevention in diabetic populations.

CONCLUSION

In conclusion, this study demonstrates that although a substantial proportion of males with Type 2 diabetes mellitus in Islamabad Capital Territory are aware of the association between diabetes and cardiovascular disease, familiarity with specific preventive screening tools and actual engagement in cardiovascular health evaluations remain insufficient. A clear and statistically significant educational gradient was observed, with participants from medical backgrounds exhibiting higher awareness, more favorable attitudes, and greater uptake of preventive screening, even after adjustment for socio-demographic factors. Notably, the attenuation between knowledge and actual screening behavior highlights a persistent intention–practice gap, suggesting that awareness alone does not guarantee preventive action. These findings underscore the need for structured, physician-driven cardiovascular risk assessment integrated into routine diabetes care, alongside targeted public health

interventions aimed at improving domain-specific health literacy and facilitating accessible, systematic screening pathways to reduce long-term cardiometabolic morbidity in this high-risk population.

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DECLARATIONS

Ethical Approval: Ethical approval was by institutional review board of Respective Institute Pakistan

Informed Consent: Informed Consent was taken from participants.

Authors' Contributions:

Concept: AM; Design: DKP; Data Collection: BAA; Analysis: MFT; Drafting: MZ

Conflict of Interest: The authors declare no conflict of interest.

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