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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии
საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებში.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman (Кириллица)**, для текста на грузинском языке следует использовать **AcadNusx**. Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи.** Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - <http://www.spinesurgery.ru/files/publish.pdf> и http://www.nlm.nih.gov/bsd/uniform_requirements.html. В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректуре авторам не высылаются, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or computer-printed on a single side of standard typing paper, with the left margin of 3 centimeters width, and 1.5 spacing between the lines, typeface - **Times New Roman (Cyrillic)**, print size - 12 (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf

In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

**Articles that Fail to Meet the Aforementioned
Requirements are not Assigned to be Reviewed.**

ავტორთა საყურადღებო!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე, დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx**. შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრაფიის ფოტოსურათები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შედეგების ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფხიხლებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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CARDIOMETABOLIC RISK PROFILES IN ADULTS WITH DIABETES: ASSOCIATIONS WITH GLYCEMIC CONTROL, DIABETES TYPE, AND DEMOGRAPHIC CHARACTERISTICS

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Abstract.

Background: Even though diabetes is a major risk factor for ischemic heart disease, modifiable risk factors like hypertension, dyslipidemia, and obesity remain significant factors in the morbidity and mortality associated with this disease in diabetic patients. The data available for the region is still scarce, particularly in the Qassim region. This research aimed to evaluate the prevalence of cardiovascular risk factors among diabetics and their association with glycemic control, diabetes type, and demographic data in the Qassim region.

Methods: A retrospective cross-sectional study was conducted of the electronic medical records (EMR) of patients with diabetes at the Diabetes and Endocrine Center in Qassim, Saudi Arabia, on 1st December 2024 until 15th May 2025. Clinical and laboratory data and demographic and anthropometric data were obtained from medical records.

Results: A high prevalence of obesity (56.6 %), physical inactivity (76.3 %), and low levels of high-density lipoprotein (HDL) cholesterol (50.6 %) were noted. There was a significant association between poor glycemic control (HbA1c > 8%) and abnormal levels of LDL and total cholesterol, with 30.95% of patients in the poor control group having high LDL and total cholesterol levels ($p < 0.001$). Type-2 diabetes mellitus (T2DM) was strongly associated with hypertension, obesity, physical inactivity, low HDL, and high triglycerides compared to type 1 diabetes mellitus (T1DM), which was associated with total cholesterol and LDL abnormalities. Male participants had a higher prevalence of dyslipidemia and smoking; female participants had a higher prevalence of obesity and physical inactivity. In addition, central adiposity and hypertension were related to age.

Conclusions: Cardiovascular risk factors were highly prevalent among adults with diabetes in the Qassim region, associated with obesity, physical inactivity, low HDL, and hypertension. The findings emphasize the critical importance of implementing routine screening protocols and customized preventive strategies, with particular focus on the elderly and individuals with T2DM, to mitigate cardiovascular disease burden in this population.

Key words. Cardiovascular, cardiovascular risk factors, diabetic patients, Qassim, Saudi Arabia, diabetes mellitus, T2DM.

Introduction.

Diabetes mellitus (DM) is a chronic metabolic-endocrine disorder characterized by inadequate insulin production or impaired insulin action or both at the same time that leads to long-term hyperglycemia [1]. Diabetes mellitus has become one of the biggest challenges of global health, affecting more

than 537 million adults in the world now, which is projected to increase to 783 million by 2045, especially in low- and middle-income countries [2].

In the context of rapid urbanization, in terms of demographics, sedentary lifestyle, and dietary differences, the patterns in low- and middle-income countries were particularly large. Almost 12.2% of the population of the Middle East and North Africa was impacted [3]. Saudi Arabia had an estimated prevalence of 7 million diabetics and about 3 million pre-diabetics, making it the 7th largest global and 2nd highest prevalence in the Middle East for DM [4]. In addition to the financial burden and clinical burden on the Saudi health care system, the increased prevalence of DM is a major public health problem [5].

Notably, DM is linked to increased mortality, high morbidity, vascular complications, and poor overall health and quality of life [6]. Evidence has suggested that diabetic patients have a two- to fourfold propensity to develop coronary artery disease (CAD) and myocardial infarction (MI) [7]. Moreover, it is thought that the main cause of death for diabetic individuals is atherosclerotic cardiovascular disease (CVD) [8]. Diabetic patients had a two-to fourfold higher risk of cardiovascular disease when compared to non-diabetics [9]. Geographic areas might have various incidences of risk variables depending on variations in environmental exposures, genetic predispositions, socioeconomic conditions, and healthcare access. Developing suitable, culturally relevant interventions and improving resource allocation depend on an awareness of these geographical patterns [10].

There is a slope to the risk of CVD in DM, and the degree of this slope is determined by a number of risk variables combined [11]. Most of these additional CVD risks in DM are associated with increased prevalence of known risk factors such as obesity, dyslipidaemia, and hypertension [12]. Over the last decade, research has shown that it is extremely important to treat patients with DM who have established risk factors to reduce the risk of them having a CVD. It has been observed that diabetics do not have good control over most of the cardiovascular (CV) risk factors [13].

The magnitude of these risk factors has been widely studied, as understanding how these risk factors relate to a patient's risk for DM may help them avoid increased rates of morbidity and mortality related to developing CVD [14]. Diabetic patients are at higher risk of heart attack and have a higher mortality rate; it was recommended to make more efforts to combat the risk factors for heart disease in diabetic patients [15]. Therefore, the analysis of cardiovascular risk profiles in local diabetic populations, such as those in Qassim, Saudi Arabia, determines national healthcare features and improvement of clinical

outcomes. Although diabetes is common nationally, there is a significant dearth of knowledge, particularly concerning the Qassim region [16].

Limited studies in this population have comprehensively investigated the prevalence and distribution of cardiovascular risk factors in diabetic patients in this area to evaluate the correlation between glycemic control and other modifiable cardiovascular risk factors. Inadequate research limited the capacity of decision-makers and healthcare professionals to apply effective, evidence-based treatments for the specific local population. Comprehensive knowledge of the prevalence and distribution of these risk factors, as well as their correlation with glycemic control and demographic features, would assist in identifying vulnerable subgroups, optimizing resource allocation, and guiding regionally customized prevention and management strategies [6,17].

Hence, the objective of this study was to close the knowledge gap and contribute to enhancing public health and clinical outcomes in the Qassim area. The prevalence and distribution of CV risk factors were investigated among the diabetic population. Additionally, the study analyzed the relationship between CV risk factors and glycemic control status (HbA1c). Furthermore, it assessed the association of CV risk factors with demographic factors, including age, sex, and type of diabetes. Defining these relationships enabled this study to improve evidence-based clinical management and preventive interventions for the diabetic population of the Qassim region, Saudi Arabia.

Materials and Methods.

Study design and setting:

The study was conducted at the Diabetes and Endocrine Center in the Qassim region, Saudi Arabia. The study period spans from 1st December 2024 until 15th May 2025. During this timeframe, medical records of diabetic patients who received care at the specified hospital were accessed and analyzed to investigate the prevalence and distribution of cardiovascular risk factors among diabetic individuals in the Qassim region.

Inclusion and exclusion criteria:

The patients included had a confirmed diagnosis of diabetes mellitus for a minimum of 6 months and complete data on demographic variables, anthropometric measurements, blood pressure, lipid profile, fasting blood glucose, and glycated hemoglobin (HbA1c). Records were excluded if any of these variables were not available, and records of pregnant women and patients with known endocrine or renal disease that could affect cardiovascular risk were not included.

Sample size:

The sample size was calculated using a single-proportion analysis with an expected hypertension prevalence of 30% among diabetes patients, 5% precision, and 95% confidence; the minimum required sample size was 323.

A total of 427 electronic medical records of diabetic patients were initially screened during the study period. Of these, 89 records were excluded due to missing key variables (demographic data, $n=18$; anthropometric measurements, $n=24$; blood pressure readings, $n=22$; lipid profile, $n=14$; HbA1c, $n=11$). An additional 18 records were excluded due to duplicate

entries. The final analysis included 320 complete records that met all inclusion criteria. Although the minimum calculated sample size was 323, the final sample of 320 achieved 95.0% power to detect the expected hypertension prevalence of 30% with 5% precision at 95% confidence.

Data collection process and study variables:

Data were retrospectively collected from electronic medical records of diabetic patients. A standardized data extraction form was utilized to extract patient data. Duplicate entries were identified and removed, and only complete records were included for analysis.

The following variables were collected for the study. Sociodemographic variables, which included gender, were recorded. Anthropometric measurements encompassed height (in cm), weight (in kg), and body mass index (BMI) (kg/m^2) and were categorized as normal ($18.5\text{--}24.9 \text{ kg}/\text{m}^2$), overweight ($25.0\text{--}29.9 \text{ kg}/\text{m}^2$), or obese ($\geq 30.0 \text{ kg}/\text{m}^2$). Waist and hip circumferences (in cm), and the waist-hip ratio (WHR) were calculated and interpreted as either high or low risk according to World Health Organization (WHO) gender-specific cut-off values.

Diabetes related variables were the type of diabetes (Type 1 or Type 2). The degree of glycemic control was determined by the measurement of fasting blood glucose level ($\leq 130 \text{ mg}/\text{dL}$ and $>130 \text{ mg}/\text{dL}$) and HbA1c level ($<7\%$, $7\text{--}7.9\%$, and $\geq 8\%$). Lifestyle factors included smoking status (current smoker, ex-smoker, or never smoker) and physical activity (active or non-active).

Heart rate (HR, beats per min) was measured at rest with automated monitors, and blood pressure (BP, mmHg) was measured by an automated sphygmomanometer, which was classified as normal ($\leq 120/80 \text{ mmHg}$), prehypertension ($121/81\text{--}139/89 \text{ mmHg}$), and hypertension ($\geq 140/90 \text{ mmHg}$). The variables considered as cardiovascular risk factors were total cholesterol level (TCL) (higher than $200 \text{ mg}/\text{dL}$ was considered abnormal and less than or equal to $200 \text{ mg}/\text{dL}$ was considered normal), low density lipoproteins level (LDL) (less than or equal to $100 \text{ mg}/\text{dL}$ was normal and more than $100 \text{ mg}/\text{dL}$ was abnormal), high density lipoproteins level (HDL) (lower than $40 \text{ mg}/\text{dL}$ was abnormal and higher was normal), and triglycerides level (TGL) (lower than or equal to $150 \text{ mg}/\text{dL}$ was normal and higher was abnormal). Additionally, WHR was assessed as a cardiovascular risk factor and was categorized as high or low risk using WHO gender specific cut-off points.

Physical activity was assessed based on patient self-report documented in medical records. Patients were classified as 'active' if they reported engaging in at least 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity aerobic physical activity per week, consistent with WHO guidelines. Those reporting less than this threshold were classified as 'non-active'."

Blood pressure (BP, mmHg) was measured using an automated sphygmomanometer with the patient seated and at rest for at least 5 minutes. Readings were classified according to the American College of Cardiology/American Heart Association (ACC/AHA) 2017 guidelines: normal (systolic $\leq 120 \text{ mmHg}$ and diastolic $\leq 80 \text{ mmHg}$), prehypertension (systolic $121\text{--}139 \text{ mmHg}$ or diastolic $81\text{--}89 \text{ mmHg}$), and hypertension

(systolic ≥ 140 mmHg or diastolic ≥ 90 mmHg). Waist and hip circumferences (in cm) were measured using a standard non-elastic tape. Waist circumference was measured at the midpoint between the lowest rib and the iliac crest. Hip circumference was measured at the maximum circumference over the buttocks. The waist-hip ratio (WHR) was calculated and interpreted as high risk or low risk according to WHO gender-specific cut-off values: high risk defined as WHR ≥ 0.90 for males and ≥ 0.85 for females.

Statistical analysis:

All data were analyzed using IBM SPSS software version 26 (Armonk, New York, IBM Corporation, USA). Categorical variables were summarized as frequencies and percentages (%), while continuous variables were presented as mean $\pm$ standard deviation or median with interquartile range (IQR) based on normality assessment using the Shapiro-Wilk test. The chi-square test was used to assess associations between cardiovascular risk factors and categorical demographic variables including HbA1c groups, gender, age groups, and diabetes type.

For regression analyses, multinomial logistic regression was employed to identify predictors of three categorical outcomes: blood pressure category (normal, prehypertension, hypertension; reference: normal), smoking status (current, ex-smoker, never; reference: never), and BMI category (normal, overweight, obese; reference: normal), with all models adjusted for age group, sex, diabetes type, smoking status (where not the outcome), physical activity, and BMI (where not the outcome). Binary logistic regression was used to identify predictors of abnormal lipid parameters including total cholesterol, LDL, HDL, and triglycerides (each coded as 0=normal, 1=abnormal; reference: normal), with the same set of covariates adjusted simultaneously in each model. All regression models were adjusted for all listed covariates, and results are reported as adjusted odds ratios (OR) with 95% confidence intervals (CI). A p-value < 0.05 was considered statistically significant for all analyses.

Ethical Considerations:

Ethical approval was obtained from the Research Ethics Committee of Qassim Health Cluster (Approval No. 246/46/607, dated 2nd October, 2024) before accessing patient medical records. The requirement for informed consent was waived by the ethics committee because this was a retrospective study using de-identified data from electronic medical records. Measures were implemented to protect patient confidentiality and adhere to ethical guidelines throughout the study process. This data was used for research purposes only.

Results.

The study included 320 participants, of whom 39.69% were aged between 40 and 60 years. Females constituted 61.88% of the sample. The median height was 157.2 cm, and the median weight was 76.2 kg. The majority (56.56%) were classified as obese. Median waist and hip circumferences were 99.2 cm and 106.0 cm, respectively, with a mean waist-hip ratio of 0.91 ± 0.11 . Type 2 diabetes was more prevalent (71.56%). Most participants were never smokers (85%) and physically inactive (76.25%). Mean heart rate was 86 ± 14 bpm. Median systolic and diastolic

blood pressures were 132 mmHg and 73 mmHg, respectively. Poor glycemic control was observed in 54.38% based on fasting blood glucose and 39.38% based on HbA1C levels (Table 1).

Among diabetic patients, 30.94% had hypertension, while 44.69% were classified as prehypertensive. Abnormal lipid profiles were observed in 19.06% for TCL, 18.44% for LDL, 50.63% for HDL, and 20.31% for TGL. Obesity was prevalent in 56.56% of participants, with 25.31% being overweight. Smoking was reported in 6.25% as current smokers and 8.75% as ex-smokers. Physical inactivity was common (76.25%). A high-risk waist-hip ratio was identified in 22.81% of participants (Table 2).

It was shown that there was a significant relationship between HbA1C level and lipid profile parameters, including TCL and LDL ($p < 0.001$). The poor control group had the maximum prevalence of abnormal TCL and LDL levels (30.95%), which showed the highest association between poor glycemic control and dyslipidemia. In addition, the prevalence of high-risk WHR was significantly higher in the fair control group (30.39%) compared to the other groups ($p = 0.041$), with HbA1C levels being significantly associated with WHR. There was no significant difference between the fair (39.22%) and poor (29.37%) control groups, whereas the good control group (23.91%) had a lower prevalence of hypertension (Table 3).

Age was significantly associated with multiple cardiovascular risk factors, with hypertension prevalence increasing with age (52.58% in >60 years vs. 12.50% in <40 years, $p < 0.001$), while abnormal TCL (32.29%) and LDL (30.21%) were more common in younger individuals and declined with age ($p < 0.001$). However, HDL abnormalities were highest in those aged over 60 years (64.95%, $p < 0.001$), and triglyceride abnormalities were most prevalent in those aged <40 years (30.21%, $p < 0.001$). Obesity (67.01% in >60 years, $p < 0.001$), physical inactivity (89.69% in >60 years, $p < 0.001$), and high-risk waist-hip ratio (39.18% in >60 years, $p < 0.001$) increased with age. Smoking history also varied, with ex-smokers more common in older groups (16.49%, $p = 0.011$) (Table 4).

Significant gender differences were observed in cardiovascular risk factors ($p < 0.05$). Males had a higher prevalence of HDL abnormalities (66.39% vs. 40.91%, $p < 0.001$) compared to females. Conversely, obesity was more common in females (62.63% vs. 46.72%, $p = 0.008$), and physical inactivity was significantly higher among females (82.32% vs. 66.39%, $p = 0.001$). Smoking was reported exclusively in males, with 16.39% being current smokers and 22.13% ex-smokers ($p < 0.001$). Additionally, a high-risk waist-hip ratio was more prevalent in males (29.51% vs. 18.69%, $p = 0.025$) (Table 5).

Significant differences in cardiovascular risk factors were observed between Type 1 and Type 2 diabetics ($p < 0.05$). Hypertension was more prevalent in Type 2 diabetics (37.99%) than in Type 1 (13.19%) ($p < 0.001$). Prehypertension was more prevalent in Type 1 diabetics (49.45%) compared to Type 2 (42.79%). Abnormal total cholesterol (28.57% vs. 15.28%, $p = 0.006$) and LDL levels (26.37% vs. 15.28%, $p = 0.021$) were significantly higher in Type 1 diabetics. In contrast, abnormal HDL (58.52% vs. 30.77%, $p < 0.001$) and triglyceride levels (25.76% vs. 6.59%, $p < 0.001$) were more prevalent in Type 2 diabetics. Thus, the pattern of dyslipidemia differed by diabetes

Table 1. Demographic Characteristics (N=320).

Demographic Characteristics	n (%)
Age Group (in years)	
<40years	96 (30)
40-60 years	127 (39.69)
>60 years	97 (30.31)
Sex	
Male	122 (38.13)
Female	198 (61.88)
Height (cm) Med [IQR]	157.2 [151.3, 164.5]
Weight (kg)Med [IQR]	76.2 [66.1, 88.5]
BMI category	
Normal	58(18.13)
Overweight	81(25.31)
Obesity	181(56.56)
Waist (cm) Med [IQR]	99.2[87.0, 108.2]
Hip (cm) Med [IQR]	106.0[100.0, 113.0]
Waist-hip ratio M± SD	0.91±0.11
Diabetes Type	
Type 1	91(28.44)
Type 2	229(71.56)
Smoking status	
Current smoker	20 (6.25)
Ex-smoker	28 (8.75)
Never	272 (85.00)
Physical activity	
Active	76 (23.75)
Non-active	244 (76.25)
Hemodynamic variables	
Heart rate (beat/minute) M± SD	86±14
Systolic blood pressure (mmHg) Med [IQR]	132 (121, 144)
Diastolic blood pressure (mmHg) Med [IQR]	73 (65, 80)
Pulse pressure M± SD/ Med [IQR]	58 (46, 73)
Mean arterial pressure M± SD/ Med [IQR]	94 (88, 101)
Glycemic control	
Fast blood glucose (mg/dL)	
Normal control (≤130 mg/dl)	146 (45.63)
Poor control (>130 mg/dl)	174 (54.38)
HbA1C levels	
Good control	92 (28.75)
fair control	102 (31.88)
Poor control	126 (39.38)

M: Mean; S.D; Standard deviation; Med: Median; IQR: Interquartile range.

Table 2. Prevalence of Cardiovascular risk factors among diabetic patients.

Risk factors	n (%)
Blood pressure (mmHg)	
Normal	78 (24.38)
Prehypertension	143 (44.69)
Hypertension	99 (30.94)
Total cholesterol (mg/dl)	
Normal	259 (80.94)
Abnormal	61 (19.06)
Low-density lipoprotein LDL (mg/dl)	
Normal	261 (81.56)
Abnormal	59 (18.44)
High-density lipoproteins (mg/dl)	
Normal	158 (49.38)

Abnormal	162 (50.63)
Triglycerides (mg/dl)	
Normal	255 (79.69)
Abnormal	65 (20.31)
Body mass index	
Normal	58 (18.13)
Overweight	81 (25.31)
Obese	181 (56.56)
Smoking	
Current	20 (6.25)
Ex smoker	28 (8.75)
Never	272 (85.00)
Physical activity	
Active	76 (23.75)
Non active	244 (76.25)
Waist-hip ratio	
High risk	73 (22.81)
Low risk	247 (77.19)

Table 3. Association between cardiovascular disease risk factors and HbA1C groups.

CV Risk Factors	HbA1C groups			p-value
	Good	Fair	Poor	
Blood pressure				
Normal	28 (30.43)	20 (19.61)	30 (23.81)	0.158
Hypertension	22 (23.91)	40 (39.22)	37 (29.37)	
Pre hypertension	42 (45.65)	42 (41.18)	59 (46.83)	
Total cholesterol (mg/dl)				
Normal	83 (90.22)	89 (87.25)	87 (69.05)	<0.001*
Abnormal	9 (9.78)	13 (12.75)	39 (30.95)	
Low-density lipoprotein LDL (mg/dl)				
Normal	82 (89.13)	92 (90.20)	87 (69.05)	<0.001*
Abnormal	10 (10.87)	10 (9.80)	39 (30.95)	
High-density lipoproteins (mg/dl)				
Normal	44 (47.83)	50 (49.02)	64 (50.79)	0.907
Abnormal	48 (52.17)	52 (50.98)	62 (49.21)	
Triglycerides (mg/dl)				
Normal	79 (85.87)	82 (80.39)	94 (74.60)	0.121
Abnormal	13 (14.13)	20 (19.61)	32 (25.40)	
BMI				
Normal	17 (18.48)	12 (11.76)	29 (23.02)	0.267
Overweight	25 (27.17)	28 (27.45)	28 (22.22)	
Obese	50 (54.35)	62 (60.78)	69 (54.76)	
Smoking				
Current	7 (7.61)	5 (4.90)	8 (6.35)	0.460
Ex smoker	11 (11.96)	10 (9.80)	7 (5.56)	
Never	74 (80.43)	87 (85.29)	111 (88.10)	
Physical activity				
Active	29(31.52)	21(20.59)	26(20.63)	0.116
Non active	63(68.48)	81(79.41)	100(79.37)	
Waist-hip ratio				
High risk	14(15.22)	31(30.39)	28(22.22)	0.041*
Low risk	78(84.78)	71(69.61)	98(77.78)	

CV: cardiovascular; OR: Odds ratio; C.I: Confidence interval; *- p value< 0.05(significant).

Table 4. Association between cardiovascular disease risk factors (Age group) based on demographic characteristics.

CV risk factors	Age group			p -value
	<40years	40-60years	>60years	
Blood pressure				
Normal	35 (36.46)	34 (26.77)	9 (9.28)	<0.001*
Hypertension	12 (12.50)	36 (28.35)	51 (52.58)	
Pre hypertension	49 (51.04)	57 (44.88)	37 (38.14)	
Total cholesterol (mg/dl)				
Normal	65 (67.71)	101 (79.53)	93 (95.88)	<0.001*
Abnormal	31 (32.29)	26 (20.47)	4 (4.12)	
Low-density lipoprotein LDL (mg/dl)				
Normal	67 (69.79)	104 (81.89)	90 (92.78)	<0.001*
Abnormal	29 (30.21)	23 (18.11)	7 (7.22)	
High-density lipoproteins (mg/dl)				
Normal	63 (65.63)	61 (48.03)	34 (35.05)	<0.001*
Abnormal	33 (34.38)	66 (51.97)	63 (64.95)	
Triglycerides (mg/dl)				
Normal	63 (65.63)	61 (48.03)	93 (95.88)	<0.001*
Abnormal	29 (30.21)	26 (20.47)	4 (4.12)	
BMI				
Normal	43 (44.79)	8 (6.30)	7 (7.22)	<0.001*
Overweight	22 (22.92)	34 (26.77)	25 (25.77)	
Obese	31 (32.29)	85 (66.93)	65 (67.01)	
Smoking				
Current	7 (7.29)	7 (5.51)	6 (6.19)	0.011*
Ex smoker	2 (2.08)	10 (7.87)	16 (16.49)	
Never	87 (90.63)	110 (86.61)	75 (77.32)	
Physical activity				
Active	35 (36.46)	31 (24.41)	10 (10.31)	<0.001*
Non active	61 (63.54)	96 (75.59)	87 (89.69)	
WHR				
High risk	5 (5.21)	30 (23.62)	38 (39.18)	<0.001*
Low risk	91 (94.79)	97 (76.38)	59 (60.82)	

OR: Odds ratio; C.I: Confidence interval; *- p value< 0.05(significant).

Table 5. Association between cardiovascular disease risk factors based on demographic characteristics.

CV risk factors	Gender		p value
	Male	Female	
Blood pressure			
Normal	27 (22.13)	51 (25.76)	0.294
Hypertension	44 (36.07)	55(27.78)	
Pre hypertension	51 (41.80)	92(46.46)	
Total cholesterol (mg/dl)			
Normal	101 (82.79)	158(79.80)	0.509
Abnormal	21 (17.21)	40(20.20)	
Low-density lipoprotein LDL (mg/dl)			
Normal	102(83.61)	159(80.30)	0.459
Abnormal	20(16.39)	39(19.70)	
High-density lipoproteins (mg/dl)			
Normal	41(33.61)	117(59.09)	<0.001*
Abnormal	81(66.39)	81(40.91)	
Triglycerides (mg/dl)			
Normal	91(74.59)	164(82.83)	0.076
Abnormal	31(25.41)	34(17.17)	

BMI			
Normal	31(25.41)	27(13.64)	0.008*
Overweight	34(27.87)	47(23.74)	
Obese	57(46.72)	124(62.63)	
Smoking			
Current	20(16.39)	0(0.00)	<0.001*
Ex smoker	27(22.13)	1(0.51)	
Never	75(61.48)	197(99.49)	
Physical activity			
Active	41(33.61)	35(17.68)	<0.001*
Non active	81(66.39)	163(82.32)	
Waist-hip ratio			
High risk	36(29.51)	37(18.69)	0.025*
Low risk	86(70.49)	161(81.31)	

Table 6. Association between cardiovascular risk factors based on demographic characteristics.

CV risk factors	Diabetic type		p -value
	Type 1	Type 2	
Blood pressure			
Normal	34(37.36)	44(19.21)	<0.001*
Hypertension	12(13.19)	87(37.99)	
Prehypertension	45(49.45)	98(42.79)	
Total cholesterol (mg/dl)			
Normal	65(71.43)	194(84.72)	0.006*
Abnormal	26(28.57)	35(15.28)	
Low-density lipoprotein LDL (mg/dl)			
Normal	67(73.63)	194(84.72)	0.021*
Abnormal	24(26.37)	35(15.28)	
High-density lipoproteins (mg/dl)			
Normal	63(69.23)	95(41.48)	<0.001*
Abnormal	28(30.77)	134(58.52)	
Triglycerides (mg/dl)			
Normal	85(93.41)	170(74.24)	<0.001*
Abnormal	6(6.59)	59(25.76)	
BMI			
Normal	45(49.45)	13(5.68)	<0.001*
Overweight	21(23.08)	60(26.20)	
Obese	25(27.47)	156(68.12)	
Smoking			
Current	4(4.40)	16(6.99)	<0.001*
Ex smoker	0(0.00)	28(12.23)	
Never	87(95.60)	185(80.79)	
Physical activity			
Active	35(38.46)	41(17.90)	<0.001*
Non active	56(61.54)	188(82.10)	
Waist-hip ratio			
High risk	3(3.30)	70(30.57)	<0.001*
Low risk	88(96.70)	159(69.43)	

OR: Odds ratio; C.I: Confidence interval; *- p value< 0.05(significant)

Table 7. Multinomial Logistic regression demographic characteristics predicting CV risk factors (Blood pressure) - Normal /Hypertension/Pre-hypertension (reference).

Variables	Prehypertension (vs. Normal)			Hypertension (vs. Normal)		
	OR	95% CI	p-value	OR	95% CI	p-value
Age Group (in years)						
<40 years	0.479	[0.137-1.673]	0.249	0.094	[0.021-0.421]	0.002*
40-60 years	0.413	[0.176-0.973]	0.043*	0.210	[0.088-0.498]	<0.001*
>60 years (Reference)	1.000	—	—	1.000	—	—
Sex						
Male	1.285	[0.638-2.589]	0.483	1.921	[0.860-4.294]	0.111
Female (Reference)	1.000	—	—	1.000	—	—
Diabetes Type						
Type 1	0.639	[0.218-1.868]	0.413	0.657	[0.167-2.582]	0.547
Type 2 (Reference)	1.000	—	—	1.000	—	—
Smoking						
Current Smoker	0.766	[0.215-2.730]	0.681	0.675	[0.158-2.887]	0.596
Ex-smoker	0.507	[0.136-1.887]	0.311	0.842	[0.231-3.070]	0.794
Never (Reference)	1.000	—	—	1.000	—	—
Physical Activity						
Active	0.820	[0.431-1.560]	0.545	0.546	[0.244-1.224]	0.140
Non-active (Reference)	1.000	—	—	1.000	—	—

CV: Cardiovascular; OR: Odds ratio; C.I: Confidence interval; *- p value< 0.05(significant).

Table 8. Multinomial Logistic regression demographic characteristics predicting CV risk factors (smoking factor) - Current smoker (current smoker) / ex-smoker/ Never.

Variables	Current Smoker (vs. Never)			Ex-smoker (vs. Never)		
	OR	95% CI	p-value	OR	95% CI	p-value
Age Group (in years)						
<40 years	4.728	[0.617-36.209]	0.135	1.046	[0.137-7.998]	0.965
40-60 years	0.750	[0.203-2.775]	0.667	0.480	[0.177-1.304]	0.150
>60 years (Reference)	1.000	—	—	1.000	—	—
Sex						
Male	0.000*	[0.000-0.000]	<0.001*	90.946	[11.832-699.067]	<0.001*
Female (Reference)	1.000	—	—	1.000	—	—
Diabetes Type						
Type 1	0.032	[0.003-0.369]	0.006*	0.000†	[0.000-0.000]	0.996
Type 2 (Reference)	1.000	—	—	1.000	—	—
BMI						
Normal	5.118	[1.050-24.952]	0.043*	0.999	[0.158-6.309]	0.999
Overweight	1.869	[0.514-6.790]	0.342	1.012	[0.358-2.857]	0.982
Obese (Reference)	1.000	—	—	1.000	—	—
Physical Activity						
Active	1.271	[0.402-4.019]	0.683	0.471	[0.199-2.112]	0.648
Non-active (Reference)	1.000	—	—	1.000	—	—

*CV: Cardiovascular; OR: Odds ratio; CI: Confidence interval; p < 0.05 (significant)

Note: The OR of 0.000 for "Male" predicting current smoker status reflects the complete absence of female current smokers in the sample (all 20 current smokers were male), creating a sparse-data/separation issue. This estimate should be interpreted with caution.

†The OR of 0.000 for Type 1 predicting ex-smoker status reflects the absence of ex-smokers in the Type 1 group (0 out of 91 Type 1 patients were ex-smokers).

Table 9. Multinomial Logistic regression demographic characteristics predicting CV risk factors (BMI) - Normal/ overweight/obese (Reference).

Variables	Overweight (vs. Normal)			Obese (vs. Normal)		
	OR	95% CI	p-value	OR	95% CI	p-value
Age Group (in years)						
<40 years	1.195	[0.228-6.256]	0.833	0.437	[0.164-1.160]	0.098
40-60 years	1.832	[0.530-6.328]	0.339	1.088	[0.354-3.345]	0.882
>60 years (Reference)	1.000	—	—	1.000	—	—
Sex						
Male	0.593	[0.245-1.435]	0.247	0.446	[0.202-0.985]	0.046*
Female (Reference)	1.000	—	—	1.000	—	—
Diabetes Type						
Type 1	0.100	[0.022-0.462]	0.003*	0.036	[0.008-0.160]	<0.001*
Type 2 (Reference)	1.000	—	—	1.000	—	—
Smoking						
Current Smoker	0.476	[0.112-2.032]	0.316	0.483	[0.128-1.825]	0.283
Ex-smoker	1.136	[0.186-6.945]	0.890	0.413	[0.077-2.210]	0.299
Never (Reference)	1.000	—	—	1.000	—	—
Physical Activity						
Active	0.478	[0.210-1.087]	0.078	0.389	[0.190-0.797]	0.009*
Non-active (Reference)	1.000	—	—	1.000	—	—

CV: Cardiovascular; BMI: Body mass index; OR: Odds ratio; C.I: Confidence interval; *- p value< 0.05(significant)

Table 10. Binary logistic regression predicting demographic risk factors for abnormal lipid parameters (TCL, LDL, HDL, TGL) - (Normal = reference category).

Variables	(Normal = reference category /abnormal)							
	TCL		LDL		HDL		TGL	
	OR [95% C.I]	p- value	OR [95 % C.I]	p- value	OR [95% C.I]	p- value	OR [95% C.I]	p- value
Age Group (in years)								
< 40 years (Reference)								
40-60 years	19.544 [4.628 - 82.532]	<0.001*	9.892 [2.748- 35.610]	0.000*	0.563[0.198- 1.598]	0.280	1.487 [0.434- 5.096]	0.528
>60 years	6.044 [2.013- 18.144]	0.001*	2.855[1.158- 7.044]	0.023*	0.642 [0.361- 1.140]	0.130	0.894 [0.474- 1.684]	0.728
Sex								
Male (Reference)								
Female	0.818 [0.398- 1.680]	0.584	0.686 [0.327- 1.442]	0.320	2.803[1.557- 5.048]	0.001*	2.336 [1.190- 4.588]	0.014*
Diabetes Type								
Type 1(Reference)								
Type 2	0.508 [0.166- 1.553]	0.235	0.508 [0.166- 1.554]	0.235	0.399 [0.147- 1.085]	0.072	0.127 [0.032- 0.514]	0.004*
Smoking								
Current (Reference)								
Ex smoker	1.978 [0.583- 6.709]	0.274	2.312 [0.687- 7.785]	0.176	0.935 [0.318- 2.749]	0.903	0.328[0.082- 1.309]	0.114
Never	0.236 [0.027- 2.060]	0.191	0.583 [0.113- 3.020]	0.521	1.739 [0.574- 5.270]	0.328	0.609 [0.223- 1.662]	0.333
Physical activity								
Active (Reference)								
Non-active	0.725 [0.358- 1.467]	0.371	0.853 [0.421- 1.727]	0.659	1.117 [0.618- 2.018]	0.714	0.701 [0.325- 1.509]	0.364

CV: Cardiovascular; TCL: Total cholesterol levels; LDL: Low-density lipoprotein (mg/dl); HDL: High-density lipoproteins (mg/dl); TGL: Triglycerides (mg/dl); OR: Odds ratio; C.I: Confidence interval; *- p value< 0.05(significant).

Note: All models use "Normal" as the reference category. Odds ratios >1 indicate increased odds of abnormal lipid levels. Odds ratios <1 indicate decreased odds of abnormal lipid levels (i.e., protective effect).

type rather than being uniformly more common in Type 2 diabetes. Obesity was significantly more common in Type 2 (68.12%) than in Type 1 (27.47%) ($p < 0.001$), while normal BMI was more frequent in Type 1 (49.45% vs. 5.68%). A higher proportion of Type 2 diabetics were ex-smokers (12.23% vs. 0%, $p = 0.001$). Physical inactivity was more common in Type 2 diabetics (82.10%) than in Type 1 (61.54%) ($p < 0.001$). Additionally, a high-risk waist-hip ratio was significantly more prevalent in Type 2 diabetics (30.57%) compared to Type 1 (3.30%) ($p < 0.001$), highlighting the greater cardiovascular risk burden in Type 2 diabetes (Table 6).

Multinomial logistic regression showed that age was significantly related to the risk of hypertension. Compared to individuals aged >60 years, those <40 years had significantly lower odds of developing hypertension (OR = 0.094, 95% CI: [0.021–0.421], $p = 0.002$). Similarly, individuals aged 40–60 years also had reduced odds of hypertension (OR = 0.210, 95% CI: [0.088–0.498], $p < 0.001$). Besides, there were significant differences in the risk of prehypertension between age groups of >60 years and 40–60 years (OR = 0.413, 95% CI: [0.176–0.973], $p = 0.043$) (Table 7).

Males had zero odds of being current smokers compared to females (OR = 0.000, 95% CI: [0.000–0.000], $p < 0.001$). This finding should be interpreted with caution, as all current smokers in the sample were male, creating a sparse-data issue that might artificially inflate the effect estimate. However, all male smokers were significantly more likely to be ex-smokers (OR = 90.946, 95% CI: [11.832–699.067], $p < 0.001$). Further, the type of diabetes was significantly related to smoking status. Individuals with Type 1 diabetes had lower odds of being current smokers compared to those with Type 2 diabetes (OR = 0.032, 95% CI: [0.003–0.369], $p = 0.006$) (Table 8).

The results showed that only diabetes type was significantly associated with BMI. Individuals with Type 1 diabetes had lower odds of being overweight (OR=0.100, 95% CI: [0.022–0.462], $p=0.003$) and obese (OR=0.036, 95% CI: [0.008–0.160], $p=0.000$) compared to those with Type 2 diabetes (Table 9).

The binary logistic regression analysis showed that there were significant associations between the demographic parameters and cardiovascular risk markers. Individuals aged 40–60 years had significantly higher odds of abnormal TCL (OR=19.544, 95% CI: [4.628–82.532], $p<0.001$), while those over 60 years also had increased odds (OR=6.044, 95% CI: [2.013–18.144], $p=0.001$). Similarly, for LDL, both the 40–60 years (OR=9.892, 95% CI: [2.748–35.610], $p<0.001$) and >60 years age groups (OR=2.855, 95% CI: [1.158–7.044], $p=0.023$) had elevated odds of abnormal levels compared to younger individuals. Regarding sex differences, females had significantly higher odds of abnormal HDL (OR=2.803, 95% CI: [1.557–5.048], $p=0.001$) and TGL (OR=2.336, 95% CI: [1.190–4.588], $p=0.014$) than males. Interestingly, the odds of abnormal TGL levels were significantly lower among the people suffering from Type 2 diabetes than in those with Type 1 diabetes (OR=0.127, 95% CI: [0.032–0.514], $p=0.004$) (Table 10).

Discussion.

It was indicated that risk factors such as dyslipidemia, obesity, and hypertension had an elevated prevalence among the diabetic

population in the Qassim region, with significant variations depending on age, sex, and type of diabetes. Inadequate glycemic control was associated with the incidence of obesity and abnormal lipid profiles, thus addressing the correlation between impaired metabolic regulation and elevated cardiovascular risk [18]. These findings have major consequences for public health campaigns intended for diabetes mellitus control as well as for clinical practice.

The primary findings revealed that 81.9% were classified as overweight or obese, 76.3 % classified as physically inactive, and approximately one-third of the study sample were diagnosed with hypertension. Most of the patients in the study sample showed at least one cardiovascular risk factor. Particularly in groups with a high burden, these ratios align with the worldwide statistics on diabetes-related comorbidities [19]. An HbA1c level exceeding 8% was the primary indicator for impaired glycemic control, which was significantly correlated with low-density lipoprotein (LDL) and total cholesterol; both of these modifiable risk factors are significant determinants in atherogenic cardiovascular mechanisms [19].

The higher prevalence of elevated LDL and total cholesterol among younger adults (<40 years) may indicate early metabolic dysfunction associated with suboptimal diet, inactive lifestyle, or genetic predisposition [20]. Conversely, HDL abnormalities and triglyceride abnormalities showed different age patterns, with HDL abnormalities more common in older adults (>60 years) and triglyceride abnormalities peaking in the middle age group (40–60 years). These findings suggest that different lipid parameters may require age-specific attention in diabetes management. These findings align with the consistent findings in the analysis that was based on 226 participants from the Dortmund Nutritional and Anthropometric Longitudinally Designed Study conducted by J. Goletzke et al. (2013), in which higher LDL levels in teenagers with T2DM were found, thus linking early-onset T2DM to dyslipidemia in the younger-aged group. These findings highlighted the need for early lipid evaluation and intervention [21].

Although BMI was not significantly associated with glycemic control in this study ($p = 0.267$), obesity was highly prevalent across all HbA1c groups. The lack of significant association between BMI and HbA1c may reflect the multifactorial nature of glycemic control, which is influenced by factors beyond body weight, including medication adherence, dietary patterns, and insulin resistance.

High-risk waist-hip ratio was significantly associated with glycemic control ($p = 0.041$); however, the highest prevalence of high-risk WHR was observed in the fair-control group (30.39%) rather than the poor-control group (22.22%). This unexpected finding may reflect the complex relationship between central adiposity and glycemic control, potentially influenced by factors such as diabetes duration or treatment intensity. Further prospective studies are needed to clarify this relationship. This clear association between inadequate glycemic control and raised waist-to-hip ratio (WHR) supports current research indicating central obesity is a more accurate indicator of cardiovascular risk in diabetes than body mass index (BMI) [22]. Visceral adiposity, metabolically active and closely linked with insulin resistance, dyslipidemia, and vascular disorders,

precisely reflects the waist-to-hip ratio (WHR) [23]. Particularly, although sex and age groups affected HDL and triglyceride levels, they showed no statistically significant correlation with HbA1c. These findings could indicate several features of lipid abnormalities in diabetes, in which glycemic control is impacted by insulin resistance, sex hormones, and genetic propensity.

Regression models highlighted the significant influence of age on hypertension prediction and gender on abnormal triglyceride and HDL levels, demonstrating the importance of individualized risk evaluations. According to these logistic regression outputs, age and type of diabetes were found to be significant predictors of dyslipidemia and obesity. The adult aged group (<40 years) showed a noticeably higher prevalence of poor LDL and total cholesterol levels; T2DM was a strong predictor of obesity. These findings suggest an association between advancing age and worsening metabolic parameters, though causality cannot be inferred due to the cross-sectional design.

The influence of gender-based variations in cardiovascular risk profiles among diabetic patients might indicate more general behavioral patterns in society. The rising rates of obesity and physical inactivity among women could be explained by lower participation in planned exercise, which might be influenced by cultural standards limiting outdoor mobility or access to fitness centers [23]. Conversely, males had higher smoking rates and more triglyceride abnormalities and lower HDL. This could be explained by the continuous exposure to modifiable behavioral hazards, including excess food and tobacco use. Therefore, gender-specific public health policies are needed [24].

The high prevalence of obesity (56.6%) and physical inactivity (76.3%) was similar to those reported in a previous self-report questionnaire study conducted by Al-Nuaim et al. (2012) in other regions of the Kingdom of Saudi Arabia and the Gulf Cooperation Council (GCC), where rapid urbanization and the associated sedentary lifestyle have been linked to the escalation of non-communicable disease trends [25]. Saleh et al. (2022) performed a cross-sectional retrospective study on 418 patients with type 2 diabetes in Riyadh and found that there was no difference in lipid abnormalities and adverse lifestyle factors between the diabetic population and the non-diabetic population [26].

In a cross-sectional, observational, and retrospective study of DM-II patients at KFUH Al Khobar, Jatoi et al. found that there was a significant association between poor HbA1C management and elevated systolic blood pressure, pulse pressure, and BMI [27], similar to the current observed correlation between suboptimal glycemic control and dyslipidemia. In a study by Einarson et al., a meta-analysis of more than 4.5 million cases of diabetes, 32.2 % of people with type 2 diabetes experienced cardiovascular disease, mostly coronary heart disease and stroke [28].

The findings of the current study indicated that dyslipidemia, with 50.6% exhibiting low HDL and 20.3% presenting increased triglycerides, as well as hypertension at 30.9%, corroborated this global trend. A significant prevalence of obesity and central adiposity was noted, which might be exacerbated in Middle Eastern populations due to cultural and nutritional habits. Although several studies, such as this retrospective study recruiting 140 patients with T2DM presented by Artha et al.,

have indicated discrepancies concerning the correlation between lipid profile and glycemic management [29], this data provided compelling evidence affirming this association, particularly for total cholesterol and LDL.

The present study results corroborated the growing evidence that poor glycemic control has a significant impact on cardiovascular risks due to its effects on lipid metabolism and obesity. An additional clinically significant marker was the increased total cholesterol and LDL (both 30.9%) in those with HbA1c > 8 %. Chronic hyperglycemia leads to oxidative stress, endothelial dysfunction, and the production of inflammatory cytokines, which will promote atherogenesis [30].

Moreover, the current study sample represents combinations of metabolic abnormalities which may increase cardiovascular risk. However, formal diagnostic criteria for metabolic syndrome were not applied in this study, as the necessary components were not systematically assessed. The observed clustering of central obesity, dyslipidemia, and hyperglycemia in this population warrants further investigation using validated diagnostic criteria [31]. Longitudinal studies with HbA1C levels over 7% showed an independent association with increased mortality and negative cardiovascular events, since myocardial infarction (MI) facilitates these pathophysiological processes [32].

The results aligned with the advice of the American Diabetes Association, which recommended keeping HbA1c levels below 7% to reduce cardiovascular risk [33]. Customized intervention strategies are needed to prevent the high tendency for cardiovascular risks in diabetes that are affected by various clinical and demographic factors. A significantly higher prevalence of cardiovascular risk factors was found to be more associated with T2DM patients than T1DM. Type 2 diabetes mellitus was found to be linked with elevated prevalence of arterial hypertension (38.0 % vs. 13.2 %), diminished HDL (58.5 % vs. 30.8 %), higher levels of obesity (68.1 % vs. 27.5 %), and high-risk waist-to-hip ratio (30.6 % vs. 3.3 %).

These findings correspond with studies revealing the risk factors of type 2 diabetes accumulating under metabolic syndrome. In contrast to type 1 diabetes, which is considered an autoimmune disorder where the patients suffer from insulin deficiency, type 2 diabetes is identified by insulin resistance, particularly associated with obesity, dyslipidemia, and hypertension [1]. Although type 1 diabetes is expected to have high total cholesterol and LDL levels, the aggregate impact of several risk factors leads to a significantly adverse total cardiovascular risk profile in type 2 patients. This difference is significant since it suggests that various forms of diabetes could influence the priorities of risk classification and intervention [34]. The high prevalence of obesity among persons with type 2 diabetes and physical inactivity (82.1%) increased their cardiovascular risk and underlined the need for comprehensive lifestyle modification programs in this group [35].

This study provided significant emerging perspectives on the prevalence and demographic associations of cardiovascular (CV) risk factors in Qassim district diabetes patients. However, specific methodological limitations must be acknowledged to appropriately interpret the findings. The use of a retrospective, single-center approach constrains the generalizability of findings to broader populations and limits external validity.

As the data were obtained from a single hospital facility, the findings might not be representative of wider regional or national patterns. Furthermore, depending on pre-existing medical records introduces potential limitations related to data accuracy and completeness, particularly concerning anthropometric, biochemical, or lifestyle variables. The cross-sectional design of the study further limited its ability to establish a temporal or causal association between glycemic control and cardiovascular risk variables. Furthermore, significant clinical features, including the duration of diabetes, adherence to pharmacological interventions, and dietary habits, were not recorded, thus impeding a complete assessment of individual metabolic control.

Primary care settings should conduct routine cardiovascular risk screening for diabetic patients to facilitate early identification and management of modifiable risk factors [36]. Customized lifestyle interventions tailored for specific high-risk subgroups, including women and the elderly population [37]. Standard diabetes therapy should include organized educational programs targeted at enhancing glycemic control [38]. Since age and type of diabetes determine dyslipidemia and obesity, the standard therapies must include regular lipid screening in the elderly population and weight management in those with T2DM [39]. Targeting particular metabolic disorders and enhancing preventive cardiovascular care depend on grouping educational initiatives according to the type of diabetes. Future multicenter, prospective studies are recommended to enhance external validity and support causal inference. There is a critical need for region-specific clinical recommendations that integrate diabetes and cardiovascular care, aligning prevention strategies with local epidemiological patterns and healthcare capacity.

Conclusion.

This study identified a high prevalence of cardiovascular risk factors among diabetic patients in Qassim, Saudi Arabia. Atherogenic lipid profiles, impaired glycemic control, and increased cardiovascular risk were associated with advanced age and T2DM. These findings suggest the need for coherent, customized, and preventative treatment strategies aimed at optimizing cardiovascular outcomes and glycemic control. In clinical practice, customized treatments should be given priority, especially for high-risk populations such as the elderly and people with T2DM.

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Аннотация.

Введение: Сердечно-сосудистые заболевания (ССЗ) остаются одной из ведущих причин заболеваемости и смертности среди пациентов с сахарным диабетом, что связано с наличием модифицируемых факторов риска, включая артериальную гипертензию, дислипидемию и ожирение. Региональные данные по Саудовской Аравии, особенно по региону Кассим, остаются ограниченными. Целью данного исследования была оценка распространенности факторов риска ССЗ среди пациентов с диабетом в регионе Кассим, а также их взаимосвязи с контролем гликемии, типом диабета и демографическими характеристиками.

Методы: Было проведено ретроспективное поперечное исследование на основе анализа электронных медицинских карт пациентов с сахарным диабетом в диабетологическом центре региона Кассим, Саудовская Аравия, в период с 1 декабря 2024 года по 15 мая 2025 года. Медицинские записи включали подробные демографические, антропометрические, клинические и лабораторные данные.

Результаты: Выявлена высокая распространенность ожирения (56,6%), низкой физической активности (76,3%) и сниженного уровня холестерина липопротеинов высокой плотности (ЛПВП) (50,6%). Плохой контроль гликемии (HbA1c > 8%) был связан с более высокими уровнями холестерина липопротеинов низкой плотности (ЛПНП) и общего холестерина (30,9%, $p < 0,001$). Артериальная гипертензия, дислипидемия, ожирение и низкая физическая активность чаще наблюдались у пациентов с сахарным диабетом 2 типа (СД2), чем у пациентов с диабетом 1 типа (СД1). Среди мужчин чаще отмечались дислипидемия и курение, тогда как среди женщин — более высокая распространенность ожирения и низкой физической активности. Кроме того, увеличение возраста ассоциировалось с абдоминальным ожирением и артериальной гипертензией.

Заключение: Факторы риска сердечно-сосудистых заболеваний широко распространены среди пациентов с сахарным диабетом и значительно связаны с СД2, пожилым возрастом и неудовлетворительным контролем гликемии в регионе Кассим. Полученные результаты подчеркивают необходимость проведения комплексного скрининга и профилактических программ, ориентированных на группы высокого риска среди пациентов с диабетом в данном регионе.

Ключевые слова: сердечно-сосудистые заболевания, факторы риска ССЗ, пациенты с диабетом, Кассим, Саудовская Аравия, сахарный диабет, СД2.

ანოტაცია.

შესავალი: გულ-სისხლძარღვთა დაავადებები (CVD) კვლავ წარმოადგენს ავადობისა და სიკვდილიანობის ერთ-ერთ მთავარ მიზეზს შაქრიანი დიაბეტის მქონე პაციენტებში, რაც დაკავშირებულია მოდიფიცირებად რისკ-ფაქტორებთან, მათ შორის არტერიულ

ჰიპერტენზიასთან, დისლიპიდემიასთან და სიმსუქნესთან. საუდის არაბეთის, განსაკუთრებით კი ყასიმის რეგიონის მონაცემები შეზღუდულია. აღნიშნული კვლევის მიზანი იყო ყასიმის რეგიონში დიაბეტთან პაციენტებში გულ-სისხლძარღვთა რისკ-ფაქტორების გავრცელების შეფასება და მათი კავშირების განსაზღვრა გლიკემიის კონტროლთან, დიაბეტის ტიპთან და დემოგრაფიულ მახასიათებლებთან.

მეთოდები: ჩატარდა რეტროსპექტული, გადაკვეთის ტიპის კვლევა, რომელიც დაფუძნებული იყო დიაბეტთან პაციენტთა ელექტრონული სამედიცინო ჩანაწერების (EMR) ანალიზზე ყასიმის დიაბეტის ცენტრში, საუდის არაბეთში, 2024 წლის 1 დეკემბრიდან 2025 წლის 15 მაისამდე პერიოდში. მონაცემები მოიცავდა დეტალურ დემოგრაფიულ, ანთროპომეტრულ, კლინიკურ და ლაბორატორიულ ინფორმაციას.

შედეგები: გამოვლინდა სიმსუქნის მაღალი გავრცელება (56.6%), ფიზიკური არაქტიურობა (76.3%) და მაღალი სიმკვრივის ლიპოპროტეინების (HDL) დაბალი დონე (50.6%). გლიკემიის არასაკმარისი კონტროლი ($HbA1c > 8\%$) ასოცირებული იყო დაბალი სიმკვრივის ლიპოპროტეინების (LDL) და საერთო ქოლესტერინის

მომატებულ დონეებთან (30.9% , $p < 0.001$). არტერიული ჰიპერტენზია, დისლიპიდემია, სიმსუქნე და ფიზიკური არაქტიურობა უფრო ხშირად აღინიშნებოდა შაქრიანი დიაბეტის მე-2 ტიპის (T2DM) პაციენტებში, ვიდრე მე-1 ტიპის (T1DM) პაციენტებში. მამაკაცებში უფრო ხშირად გვხვდებოდა დისლიპიდემია და თამბაქოს მოხმარება, ხოლო ქალებში — სიმსუქნე და ფიზიკური არაქტიურობა. ასევე, ასაკის ზრდა დაკავშირებული იყო აბდომინალურ სიმსუქნესთან და არტერიულ ჰიპერტენზიასთან.

დასკვნა: გულ-სისხლძარღვთა რისკ-ფაქტორები ფართოდ არის გავრცელებული შაქრიანი დიაბეტის მქონე პაციენტებში და მნიშვნელოვნად ასოცირებულია T2DM-თან, ასაკის ზრდასთან და გლიკემიის არასაკმარისი კონტროლთან ყასიმის რეგიონში. აღნიშნული შედეგები მიუთითებს მაღალი რისკის მქონე დიაბეტთან პაციენტებში კომპლექსური სკრინინგისა და პრევენციული პროგრამების განხორციელების აუცილებლობაზე.

საკვანძო სიტყვები: გულ-სისხლძარღვთა დაავადებები, რისკ-ფაქტორები, დიაბეტთან პაციენტები, ყასიმი, საუდის არაბეთი, შაქრიანი დიაბეტი, T2DM.