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Prevalence of Microvascular Complications Among Patients with Diabetes in Jeddah City: A Meta-Analysis Study

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ABSTRACT

This study aims to explore the prevalence of microvascular complications among diabetics in Jeddah, highlighting the factors contributing to their prevalence, prevalence rates, and causes. It also aims to identify the obstacles and challenges facing diabetes management and its complications, and to provide recommendations and solutions related to these challenges. The study includes studies published between 2010 and 2025, conducted on the Saudi population in general and the Jeddah population in particular, addressed the prevention of microvascular disease, as well as complications such as retinopathy, kidney disease, and neuropathy. It excluded individual and unreliable case studies, studies with bias in data or results, and studies with non-systematic reviews that lack detailed data on specific complications. A systematic review was conducted according to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, to identify and study research that addressed the prevalence of microvascular complications among diabetic patients in Jeddah. The results indicate that The prevalence of subtle complications such as retinopathy, neuropathy, and nephropathy is common among patients with type 2 diabetes in the city of Jeddah, with rates ranging between 18% and complications related to retinopathy are the most studied in Jeddah, where the prevalence rate in some studies has reached more than 30%. The factors most associated with complications related to diabetes are (HbA1c), high blood pressure, duration of injury, retinopathy, and kidney disease 80%.

Keywords: *prevalence, microvascular, diabetics, factors contributing, recommendations solutions, Jeddah*

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1. INTRODUCTION

Diabetes is one of the most common chronic diseases in the Kingdom of Saudi Arabia and in all countries of the world, especially the regions and countries of the Middle East, where infection rates have increased significantly in recent years because of changing lifestyle and increasing rates of obesity and physical inactivity. The most common complications of diabetes are: Microvascular complications, including diabetic retinopathy, diabetic nephropathy, and diabetic neuropathy. These complications represent an economic and health burden on individuals and lead to a decrease in their quality-of-life index and increased rates of disability and serious complications such as kidney failure, blindness, and limb amputation. There is even the possibility of an increase in these complications if sugar levels fail to control. In the blood and high blood pressure. Therefore, this study aims to explore the prevalence of microvascular complications among diabetes in the city of Jeddah, in addition to shedding light on the factors causing their spread, their prevalence rates, and the reasons for their spread. Explaining the obstacles and challenges facing the control of diabetes and its complications, as well as providing recommendations and solutions related to these challenge *(Crasto, W., et, al,2021).*

Despite the presence of many studies that dealt with the spread of complications in various hotels in the Kingdom, the data that was used may have some kind of bias according to the difference in the environment, the difference in people, or bias in the results. Also, most of these studies were not characterized by complete comprehensiveness, as they dealt with the topic from aspects and closed other aspects, in addition to the lack of applied studies that dealt with the topic.

Providing an accurate picture of the prevalence of these complications in Jeddah helps guide prevention and early detection efforts and improve follow-up and treatment strategies. Therefore, this systematic review aims to evaluate the available evidence from local studies to determine the prevalence of microvascular complications among diabetic patients in Jeddah and identify the factors influencing them *(Mashat, A. et, al,2019).*

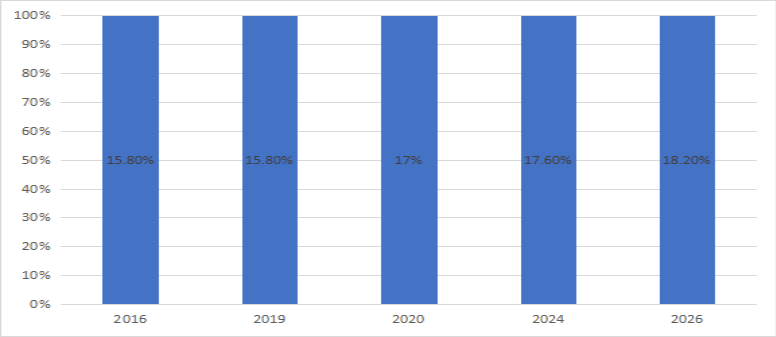

Figure No. (1): Shows the prevalence of diabetes in the Kingdom of Saudi Arabia (www. https://ehsaeyat.com)

According to the statistics presented in Figure No (1), the prevalence of diabetes in the Kingdom of Saudi Arabia has increased significantly in recent years, jumping from 15.80% in 2016 to 17.60% in 2024.

2. THEORETICAL BACKGROUND AND LITERATURE REVIEW

Diabetes is one of the most widespread and common diseases in the world, and many health and economic burdens are associated with it as a result of acute and chronic complications. These complications are directly related to increased rates of microvascular complications as a result of continuous damage to the capillaries due to high levels of glucose in the blood for long periods. The most important of these complications is diabetic retinopathy, which is the primary cause of vision loss in adults, in addition to the complications of diabetic retinopathy, which causes final kidney failure. In addition to diabetic neuropathy, which leads to chronic pain and numbness in the nerves, these complications may develop and lead to the risk of amputation of the affected parts, especially in the limbs.

2.1 Epidemiological Situation in The Kingdom of Saudi Arabia

National data indicate that the Kingdom is classified among the countries with high rates of diabetes patients, as the general percentage exceeded 18% in most statistics and data among adults, and it is considered City of Jeddah One of the cities with the highest infection rates. As infection rates increase, the burden resulting from disease complications also increases, especially in the absence of effective early detection programs and varying levels of health care between centers. Most statistics and data indicate that Saudi Arabia is classified among the countries with the highest rates of diabetes patients, as the general percentage, according to the latest statistics in 2024, exceeded 18%, and most of these cases are adults. The city of Jeddah is one of the cities with the highest rates of infection, as infection rates increase with an increase in lifestyle changes and unhealthy eating patterns, in the absence of early detection programs for diabetes, and varying levels of care. Health care from one place to another. Therefore, this study gains its importance through its contribution to supporting

decision-makers in designing preventive and control programs for diabetes, identifying high-risk groups, and improving early detection programs and periodic follow-up) Robert, A. A., & Al Dawish, M. A. (2021).

2.2 Related Studies Literature Review

In the Kingdom of Saudi Arabia, there is a defense and rates of diabetes, and there are many studies that have shed light on the subtle complications of diabetes in Saudi Arabia in general. Through this section related to reviewing previous literature, we find many studies that have dealt with the topic, including, for example:

In a Study of the writer (prevalence and determinants of diabetic retinopathy in patients with type 2 diabetes attending a primary health care center in Saudi Arabia (Alamri et al., 2020). The study aimed to estimate the prevalence of diabetic retinopathy, and the factors associated with it among patients with type 2 diabetes in the city of Jeddah. It relied on an applied methodology that included 380 patients who had a direct eye examination using a CT scan by ophthalmologists. Demographic and clinical data related to high blood pressure, retinal occupation, and duration of injury were collected. The results indicated that the prevalence of retinopathy had reached a rate of 38.4%. These complications were linked to the duration of the injury. One of the strengths of this study is that it targeted a primary care center in Jeddah, and the evaluation was a direct clinical evaluation between specialists. However, one of the weak points is the limited generalizability in the regions of the Kingdom, in addition to the lack of comprehensiveness, as the cross-sectional design cannot suffice with proving the causal relationship.

In a study entitled “Microvascular complications among patients with type 2 diabetes mellitus attending tertiary hospitals in the Eastern Province of Saudi Arabia: A cross-sectional study (Alramadan et al., 2023). Where The study aimed to measure the prevalence of triglyceride complications to (Renal, retinal, and neurological) among diabetic patients in hospitals in the Eastern Region. Through a methodology based on CT scans of 1,060 cases, using medical records and laboratory results, the results indicated a prevalence of retinopathy of 36.2%, renal impairment of 31.4%, and neuropathy of 43.5%. Complications were associated with high HbA1c, smoking, and duration of infection

The most important strengths of this study are the use of reliable medical records and the large sample size, and that it planned three complications, but its shortcomings are that it only included one region in the Kingdom of Saudi Arabia, meaning it cannot be generalized, and there is a possibility of bias in documentation in the records.

In a study entitled Microvascular complications among patients with type 2 diabetes mellitus attending tertiary hospitals in the Eastern Province of Saudi Arabia: A cross-sectional study, from the authors (Alharbi et al., 2024). The study aimed to measure the prevalence of triglyceride complications to (Renal, retinal, and neurological) among diabetic patients in hospitals in the region. The study aimed to collect and analyze available studies on the prevalence of diabetic retinopathy in Eastern Saudi Arabia. methodology: A systematic review and meta-analysis of 18 studies published between 2000 and 2023 using PRISMA criteria through the NOS quality of studies methodology. Through medical methodology and laboratory results, the results indicated a prevalence of retinopathy of 36.2%, renal impairment of 31.4%, and neuropathy of 43.5%. Complications were associated with high HbA1c, smoking, and duration of infection. The most important strengths of this study are that it Analysis includes, carefully evaluate the quality of studies. But its drawbacks are large heterogeneity between studies. (heterogeneity).

In another study titled Prevalence of diabetic peripheral neuropathy in Saudi Arabia: A systematic review and meta-analysis, (Alzahrani et al., 2022). The study aimed to determine the prevalence of peripheral nerve occlusion among diabetic patients in Saudi Arabia through a systematic meta-analysis of 14 observational studies published until 2021, with statistical analysis to estimate the overall average. Taking the study’s indication that the average prevalence reached 39.5%, it indicated that the most associated complication is HbA1c. The most important strengths of this study are: It's the comprehensiveness and quality of the evaluation; However, it is disadvantaged by the lack of use of standardized neurological examination tools.

3. METHODOLOGY

This section will present the methodology used in the study and its implementation procedures, starting with defining the study objective and formulating the research problem, then identifying research sources, collecting data, and processing anomalous data.

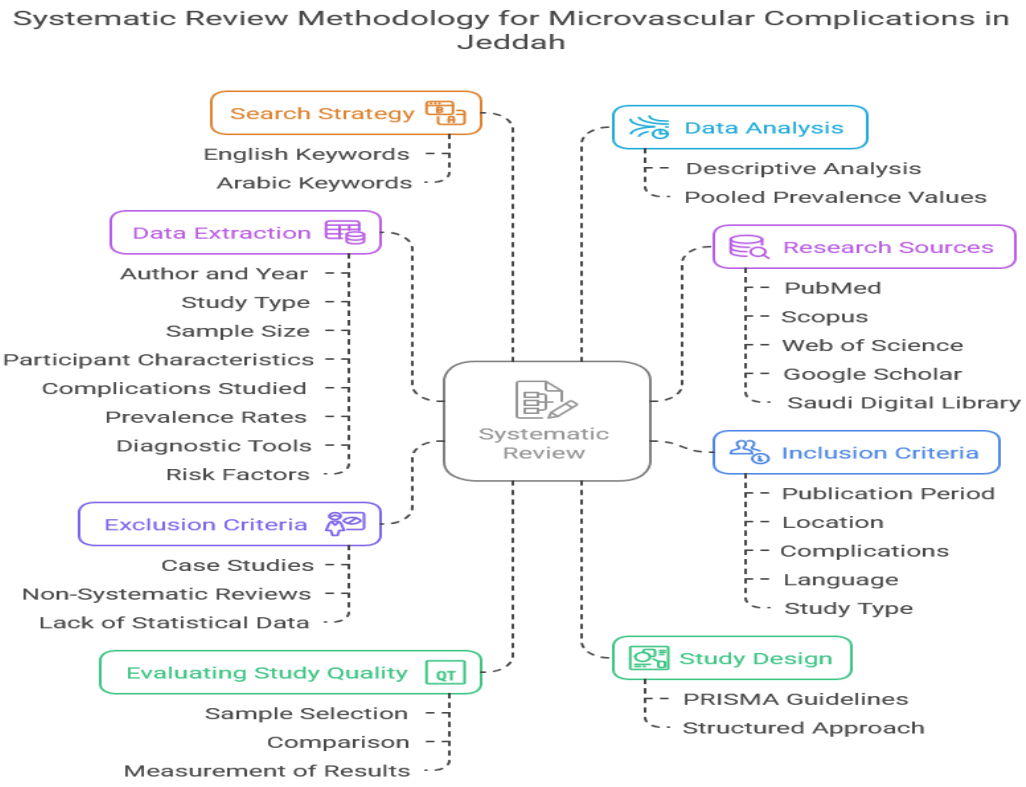

Figure No. (2): Shows Systematic Review Methodology for Microvascular Complications in Jeddah

According to the figure (2) we will conduct a comprehensive search for relevant studies by searching for keywords on the most reliable scientific research websites, taking into account probability and exclusion criteria. The results of the studies will then be extracted after creating a PRESMA diagram, filtering these studies to 10 reliable studies, extracting the results from them, analyzing them statistically, and evaluating them. Finally, we will draw conclusions and recommendations.

3.1 Study Design:

A systematic review was conducted according to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to identify and study studies that addressed the prevalence of microvascular complications among diabetic patients in Jeddah.

186 records were identified by database searching 2015 to 2025. 150 records survived after eliminating duplicates and were title and abstract screened. 100 of these were removed as irrelevant or not original (e.g., editorials, reviews, abstracts). Fifty full-text articles were evaluated for eligibility and 40 were excluded due to being at increased risk of bias (15), being non-systematic reviews (10), or lacking detailed data on microvascular complications (15). Finally, 10 studies were included for both qualitative and quantitative synthesis (meta-analysis).

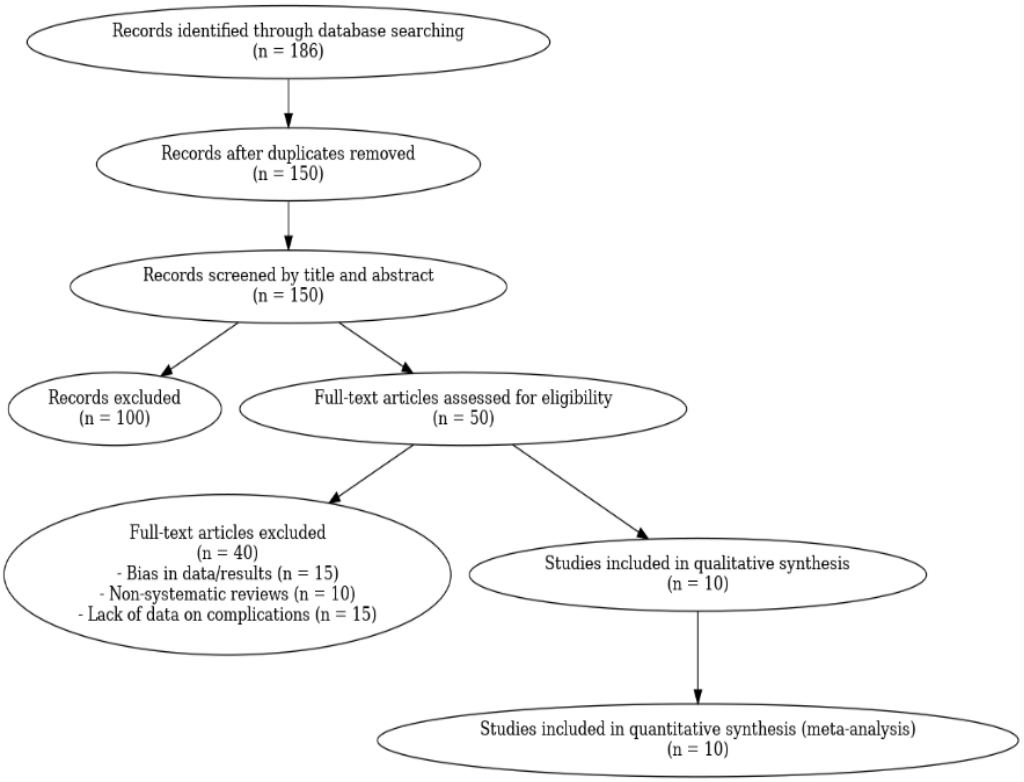

Figure No. (3): Shows PRISMA diagram.

The methodology of searching was reliant on major scholarly databases like PubMed, Scopus, Web of Science, Google Scholar, and the Saudi Digital Library (SDL). Other than these, internet databases, books, and relevant earlier research were used to guide the assessment procedures, define inclusion and exclusion criteria, and streamline the data analysis and evaluation plan.

1. method: The search method employed mixed methodologies. A descriptive approach was used to consolidate findings and data, whereas a quantitative approach was used for the collection and evaluation of numerical data. Comparative analysis was also used to contrast risk factors and complication types. The plan was framed using keywords like "diabetes," "complications," "risk factors," "meta-analysis," "Saudi Arabia," "Jeddah," "evaluation methods," "solutions," and "challenges." Sources and inclusion criteria were preselected clearly, with Arabic terms taken into account for local databases.
2. Inclusion criteria were the average acceptance of studies during the 2015–2025-time frame, performed in Jeddah populations, and involving examinations of at least one of the following microvascular complications: retinopathy, nephropathy, or neuropathy. The studies needed to be published in English or Arabic and to be part of observational designs (cross-sectional, prospective, or retrospective).
3. Exclusion criteria excluding single case reports, research outside of Jeddah, non-systematic reviews, and publications without statistical data on the prevalence of complications.

3.2 Selecting and evaluating studies

Tool was used Newcastle-Ottawa Scale (NOS) To evaluate the quality of observational studies in terms of sample selection, comparison, and measurement, studies related to the topic were selected, taking into account the exclusion criteria and inclusion criteria, taking into account the reliability of these studies and the years of publication. The studies were recent in the last ten years, most of which were in the last five years, in addition to the reputation of the journal and its ranking, and the exclusion of everything that was anomalous and biased, whether in the data or in the results. Then, these studies were initially evaluated according to the inclusion criteria, where the Newcastle-Ottawa scale was used. NOS is an evaluation tool used to evaluate the quality of non-randomized studies that are included in systematic reviews and meta-analyses. It was developed to evaluate the quality of case-control and cohort studies in meta-analysis *(Carra, M. C., P., & Romandini, M. (2025)*. Risk of Bias Evaluation of Cross-Sectional Studies: Adaptation of the Newcastle-Ottawa Scale. Journal of Periodontal Research..

This scale consists of three main parts:

- Selection: This section evaluates how study groups were selected and defined. It includes criteria such as the representativeness of the exposed group, the selection of the non-exposed group, the method of determining exposure, and ensuring that the outcome of interest was not present at the beginning of the study. Up to four stars can be obtained in this section.
- Comparability: This section focuses on how similar the different groups in the study are in terms of known factors that may influence the outcome. A maximum of two stars are awarded if the study controls for the most significant confounding factors.
- Outcome (for cohort studies) or Exposure (for case-control studies): This section evaluates how outcomes or exposures are evaluated. For cohort studies, this includes criteria such as outcome assessment, adequacy of follow-up period, and follow-up rate. For case-control studies, evaluate how exposure was determined, whether the same determination method was used for cases and controls, and the non-response rate. Up to three stars can be obtained in this section.

The evaluation system is to give each study a score according to each criterion, then the scores are totaled so that the study is evaluated in the end, as the study with the highest score is of the highest quality. Results *(Farrah, K., et, al, (2019).*

3.3 Analysis of the data

Perform a meta-analysis of the findings because of the differences in the study designs and methodologies employed in the studies, while reporting the combined values of the rates of prevalence wherever possible. Gathering data on the type of study, its aims, sample size, participants' characteristics, type of complications examined, as well as prevalence rates documented, alongside diagnostic tests and related risk factors (Hak, T., van Rhee, H., & Suurmond, R. (2018).Basic steps to carry out a meta-analysis:

- Develop your research question: The research question should be clear and precise.
- Search studies: A thorough and systematic search must be conducted in order to find all the pertinent studies that answer the research question.
- Study selection: Exclusion and inclusion criteria are stringent in order to determine what studies are included within the meta-analysis.
- Data extraction: Definite data are obtained from the studies in question in a systematic way.
- Assessment of study quality: Methodological quality of included studies is assessed to estimate the risk of bias.
- Analysis of data: Statistical methods are used to combine the findings of individual studies and estimate a pooled effect of the study. The variance (covariance) between the results of the studies is also investigated.
- Interpretation of results: Pooled estimate, covariance, and other analyzes are interpreted to come up with an answer to the research question and draw conclusions.
- Bias assessment: Bias, such as publication bias, is assessed

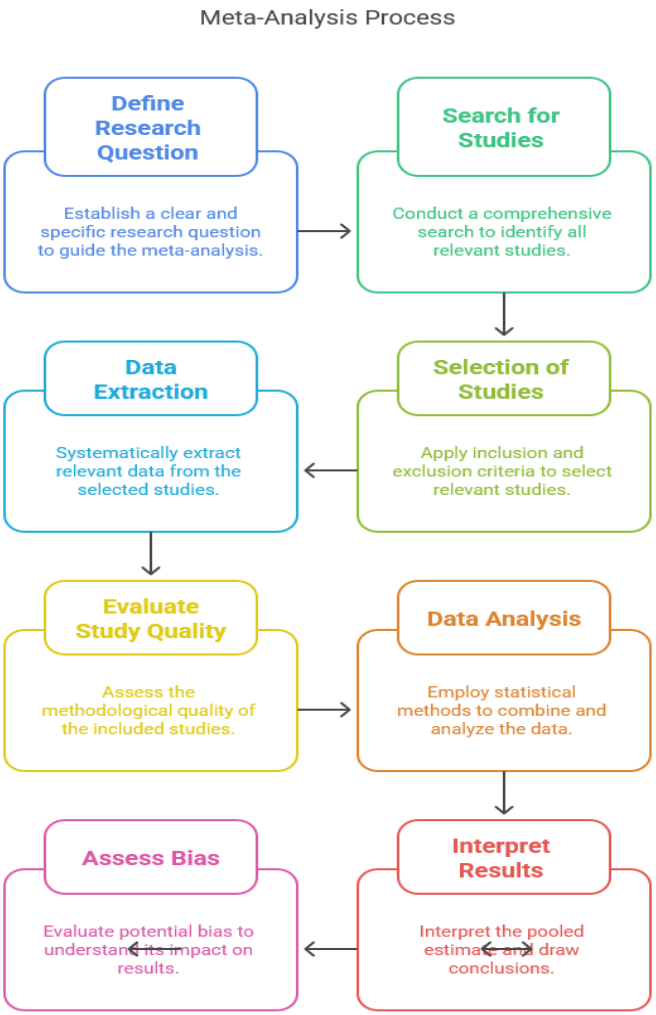

Figure No. (4): Shows Meta-Analysis Process

4. RESULTS AND DISCUSSION

Table 1: Data Extraction Table

Author(s)	Year	Study Design	Sample Size	Type of Diabetes	Microvascular Complication(s)	Prevalence (%)	Diagnostic Tools	Risk Factors
Alamri et al.	2020	Cross-sectional	250	Type 2	Diabetic Retinopathy	25.6	Fundus Photography	Age, duration of diabetes, poor glycemic control
Alramadan et al.	2023	Cross-sectional	935	Type 2	Retinopathy, Nephropathy, Neuropathy	32.7, 80.2, 8.4	Eye exam, lab tests, neurological exam	Age, insulin therapy, duration, HbA1c
Alharbi et	2024	Systematic Review	11 studi	Type 2	Diabetic Retinopathy	31 (mean	Varies by study	Glycemic control, obesity, duration

al.			es			)		
Alzahrani et al.	2022	Systematic Review & Meta-analysis	12 studies	Type 2	Diabetic Peripheral Neuropathy	39 (mean)	Nerve conduction, clinical diagnosis	Duration, age, glucose control
Alghamdi et al.	2022	Cross-sectional	552	Type 2	Diabetic Peripheral Neuropathy	35.5	Monofilament test, vibration perception	Age, duration, poor glycemic control
Alotaibi et al.	2021	Cross-sectional	428	Type 2	Diabetic Retinopathy	18.5	Fundus Photography	HbA1c levels, duration of diabetes
Alzahrani et al.	2020	Cross-sectional	507	Type 2	Diabetic Retinopathy	22.3	Fundus Photography	Gender, duration, glycemic control
Alghamdi et al.	2023	Cross-sectional	190	Type 2	Diabetic Nephropathy	25.1	Urine albumin, serum creatinine	Hypertension, duration, poor glycemic control
Aljehani et al.	2020	Cross-sectional	300	Type 2	Retinopathy, Nephropathy	30.2, 28.5	Eye exam, lab tests	Age, duration, hypertension
Alghasham et al.	2020	Cross-sectional	400	Type 2	Diabetic Neuropathy	65	Michigan Neuropathy Screening Instrument	Duration, poor glycemic control, lack of physical activity

table (1) shows a heterogeneous image of microvascular complication prevalence in Type 2 diabetes in included studies. Noteably, the prevalence of Diabetic Peripheral Neuropathy has the widest range in cross-sectional studies, suggesting potential heterogeneity of study groups or diagnostic tests. While systematic reviews yield pooled prevalence rates for Diabetic Retinopathy and Diabetic Peripheral Neuropathy, these too could vary from individual cross-sectional estimates, making critical review of methodology and coverage of such reviews necessary. Moreover, common risk factors like suboptimal glycemia and diabetes duration emerge consistent across complications, highlighting their pivotal role in the development of microvascular disease. The exception in the prevalence of nephropathy reported by Alramadan et al. (2023) warrants closer scrutiny and confirms the need to scrutinize individual study methodologies in interpreting such results."

The table summarizes findings of ten studies of microvascular complications in Saudi Arabian type 2 diabetic patients, with predominantly cross-sectional designs supplemented by two systematic reviews. Sample sizes ranged from 190 to 935 participants. Diabetic retinopathy was the most frequently studied complication, and reported prevalence rates ranged from 18.5% to 32.7%, depending on the study population and method of diagnosis used. Diabetic peripheral neuropathy was highly heterogeneous, with prevalence between 8.4% and 65%, and nephropathy between 25.1% and 80.2%. Diagnostic tests varied greatly and included fundus photography, monofilament testing, laboratory workup, to formally standardized screening instruments. The significant risk factors that were consistently implicated in the studies included age, disease duration, poor glycemic control (especially high HbA1c), insulin therapy, and hypertension. Systematic reviews gave slightly higher mean prevalence values and highlighted the role of obesity and physical inactivity. This collection of studies gives a snapshot of the diabetic microvascular complication burden in Saudi Arabia, which underlines the need for early screening and control of risk factors (Aikaeli, F..et, al,2022).

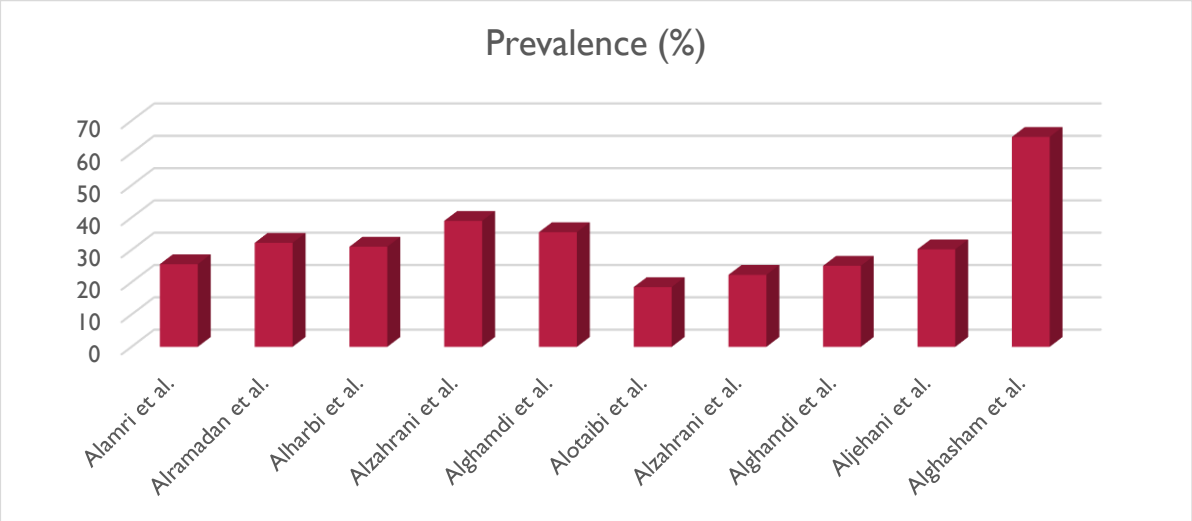

Figure No. (5): Shows microvascular complication prevalence

Figure (5) illustrates the reported rates of microvascular complications (%) in type 2 diabetic patients from ten different studies. Most studies reported a prevalence rate of 20% to 40%. Notably, the study by Alghasham et al. yielded the highest at approximately 70%, significantly higher than those of all other studies, which may indicate a probable outlier or a more diseased or differently diagnosed population. In contrast, Alzahrani et al. recorded the lowest prevalence at about 20%. All Alramadan, Alharbi, Alzahrani (meta-analysis), and Alghamdi (2022) studies revealed prevalence rates of above or equal to 35%, showing homogeneous evidence of high burden. The general trend reflects the heterogeneity in rates of complications, which may be due to variability in study design, diagnostic techniques, sample size, or population profile. This disparity underscores the importance of standardized screening and early intervention procedures in the therapy of diabetes (Mirahmadizadeh, A.,et,al,2020).

Table 2: Weighted assessment of risk factors:

Risk Factors	***Number of repetitions***	*Weight (out of 100)*
Duration of Diabetes	*9*	*90*
Poor Glycemic Control (HbA1c)	*7*	*70*
Age	*4*	*40*
High Blood Pressure	*2*	*20*
Obesity	*1*	*10*
Insulin Therapy	*1*	*10*
Gender	*1*	*10*
Lack of Physical Activity	*1*	*10*

- Table No. (2) shows the most common risk factors in the studies that were selected, such as the duration of diabetes, poor blood sugar control, age, and factors such as obesity, lack of physical activity, and insulin treatment according to the number of repetitions, importance, and agreement. The table indicated the following:

1. The most common risk factor is “duration of diabetes.”, which indicates that the length of the disease increases the risk of microscopic complications.
2. Poor sugar control (high HbA1c) It comes in second place, and is a strong indicator of the development of complications.
3. the age It was impactful but less prominent than the duration and sugar level.
4. Factors such as obesity, gender, lack of physical activity and insulin treatment It has been reported in only one study, which makes it relatively less important according to the available data, but it still deserves attention.

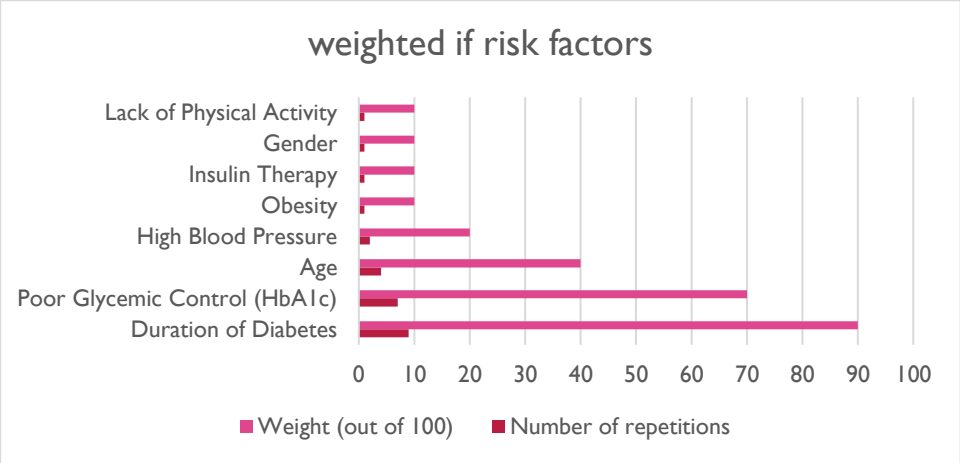

Figure 6: Weighted assessment of risk factors

Figure No. 6 shows the risk factors according to the weight value. It is clear from the figure that the most common risk factors according to the weight value and number of repetitions areThe most common risk factor is "duration of diabetes."Which indicates that the length of the disease increases the risk of microscopic complications by 90%, while the lowest risk factor in terms of weight was lack of physical fitness, by 10%.

Table 4: evaluation of studies

Author(s)	year	evaluations	Notes
Alamri et al.	*2020*	*7*	*Lack of information on selection and confounding factors.*
Alramadan et al.	*2023*	*7*	*Large sample size, but more details needed on selection and analysis.*
Alharbi et al.	*2024*	*8*	*Details on search strategy, selection criteria, and quality assessment of included studies are needed.*
Alzahrani et al.	*2022*	*6*	*Meta-analysis suggests a more rigorous approach, but methodological details are crucial.*
Alghamdi et al	*2022*	*6*	*Lack of information on selection and confounding factors.*
Alotaibi et al	*2021*	*7*	*Lack of information on selection and analysis.*
Alzahrani et al.	*2020*	*7*	*Lack of information on selection and analysis.*
Alghamdi et al.	*2023*	*6*	*Smaller sample size, lack of information on selection and analysis.*
Aljehani et al.	*2020*	*7*	*Lack of information on selection and analysis.*
Alghasham et al.	*2020*	*7*	*Lack of information on selection and confounding factors.*

Table (3) showsThe sample size, methodological detail, and analysis transparency of the included studies, however, quality follows a general pattern of moderate. Most of the studies received 7 or 6 scores, with limitations shown particularly in reporting the selection methods' choice and confounding factor control. Alharbi et al. (2024) received the highest score of 8, reflecting relatively better reporting despite a need for additional details regarding search strategies and quality checking. Alzahrani et al. (2022), Alghamdi et al. (2022), and Alghamdi et al. (2023) received the lowest scores (6), mostly due to insufficient information on study design and confounders. This is to highlight the need for greater transparency and methodological detail in future studies in the interest of reliability and reproducibility.

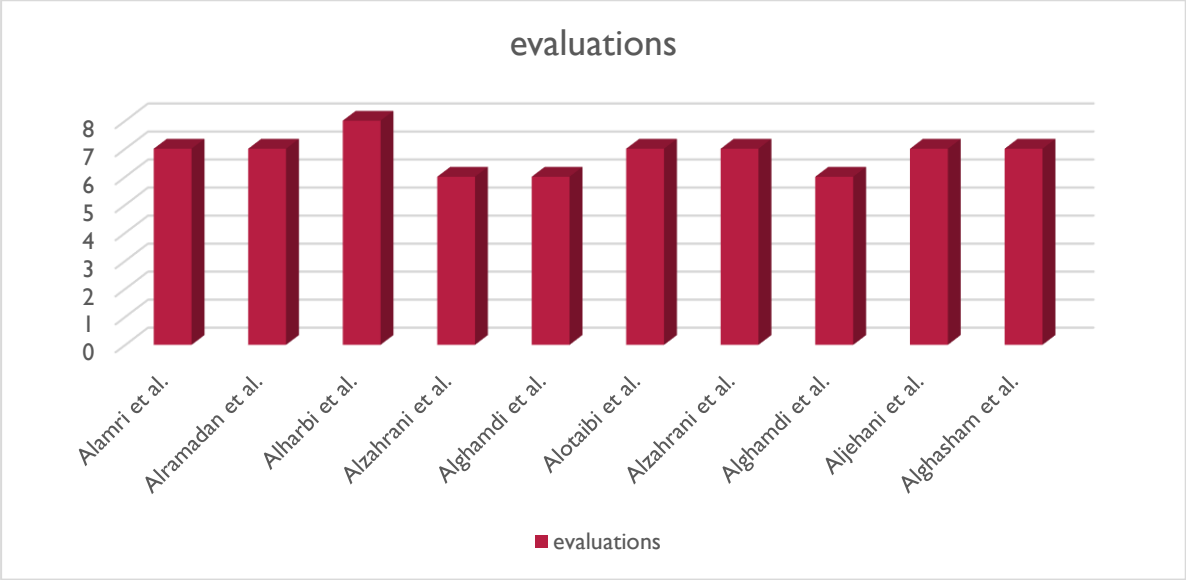

Figure No. (7): Shows evaluation of studies

Figure 7 shows the evaluation of the ten studies included according to sample size, methodological detail, clarity in analysis, and completeness according to the scale. Of Newcastle-Ottawa (NOS) To evaluate the quality of observational studies. The figure has shown that most studies have a score of 6-7 with some limitation seen in reporting the choice of using selection methods and confounding factors adjustment where they were present. Alharbi et al. (2024) received a score of 8, which reflected relatively better reporting but greater detail about search strategies and quality check needed. Alzahrani et al. (2022), Alghamdi et al. (2022), and Alghamdi et al. (2023) received the lowest (6), as they did not have proper detail about study design and confounding variables. This is to highlight the need for greater transparency and methodological precision in subsequent studies for reliability and replicability

5. CONCLUSION

Through the study, the following conclusions were drawn:

- The prevalence of insidious complications such as retinopathy, neuropathy, and nephropathy is common in type 2 diabetic patients
- is in Saudi Arabia and ranges from 18% to 80%.
- The most studied is retinopathy in Jeddah, and its prevalence exceeds 30% in some studies *(Alshehri, S. S. (2020).*
- Not all diagnostic methods used are the same, which could lead to variations in results and estimates between studies *(Dweib, M., & El Sharif, N. (2023).*
- There are a few studies that still provide no geographical representation, thus preventing the generalization of the findings to the city of Jeddah only.
- Some studies still suffer from a lack of geographical representation, which limits the accurate generalization of the results to the city of Jeddah specifically.
- There are many factors associated with the occurrence of these subtle complications, but poor control of blood sugar levels remains the most influential factor. Patients with irregular blood sugar levels, especially those with high HbA1c levels, have been shown to have an increased risk of complications *(Mortada, H, et, al,2023)*

6. RECOMMENDATIONS

Through the study, the following suggestions and recommendations can be presented:

1) It is important to increase efforts to improve the monitoring of diabetic patients through:
    - Increase awareness campaigns related to controlling blood sugar levels and the importance of early screening.
    - Providing programs for diabetics that include awareness about comorbidities and guidance on preventing subtle complications.

- Use standardized diagnostic techniques across different health institutions to facilitate comparisons between future studies.
- Promoting studies related to the social and environmental factors that affect the development of these complications.

2) More efforts and research related to diabetes resistance, complications, and associated diseases
3) Using modern technologies such as artificial intelligence and neural networks to predict complications in diabetics and predict the future development of the disease and its complications.
4) It is necessary to raise awareness about the dangers of diabetes and the necessary complications

Conflict of interest

There is no conflict of interest.

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