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BURDEN OF DIABETES MELLITUS IN A RURAL POPULATION: A CROSS SECTIONAL SURVEY

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Abstract
Background: Diabetes Mellitus (DM) is a chronic metabolic disorder characterized by elevated blood glucose levels, leading to serious damage to the heart, blood vessels, eyes, kidneys, and nerves. The prevalence of diabetes is increasing globally, with significant impacts on rural populations due to unique socioeconomic, cultural, and healthcare access challenges. **Aims:** To assess the burden of Diabetes Mellitus in a rural population. **Methods:** A cross-sectional survey was conducted in a rural area, with a sample size of 200 adults selected through stratified random sampling. The study collected data on demographic characteristics, diabetes status, risk factors, and access to healthcare services. Statistical analysis included descriptive statistics and logistic regression. **Results:** The findings of this survey will provide insights into the prevalence of diabetes, associated risk factors, and the healthcare-seeking behaviors of a rural population. **Conclusion:** Understanding the burden of Diabetes Mellitus in rural areas is crucial for the development of targeted interventions to improve disease management and prevention strategies in these communities.
Keywords: Diabetes Mellitus, Rural Health, Prevalence.

Introduction

Diabetes Mellitus (DM) represents a significant public health challenge that affects millions of individuals globally, leading to increased morbidity and mortality rates. The burden of diabetes is not uniformly distributed, with a notable increase in prevalence in rural areas, where access to healthcare and health literacy are often limited. This disparity poses challenges in the management and prevention of diabetes, making it imperative to understand the specific needs and barriers faced by rural populations.[1]

Several studies have highlighted the rising prevalence of DM in rural settings, attributed to lifestyle changes, dietary habits, and a lack of awareness about the disease. The transition from traditional to more sedentary lifestyles and the adoption of high-calorie diets contribute to this trend. Furthermore, rural residents often face significant obstacles in accessing

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healthcare services, including limited availability of health facilities, financial constraints, and a lack of trained healthcare professionals, exacerbating the situation.[2]
Research has shown that early detection and proper management of diabetes can significantly reduce the risk of complications. However, in rural areas, delayed diagnosis and inadequate treatment are common, leading to a higher incidence of complications. This underscores the importance of conducting epidemiological studies in these regions to gather data that can inform effective public health strategies.[3]

Aim
To evaluate the burden of Diabetes Mellitus in a rural population.

Objectives
1. To determine the prevalence of Diabetes Mellitus in the rural population.
2. To identify the main risk factors associated with Diabetes Mellitus in this population.
3. To assess the accessibility and utilization of healthcare services by individuals with Diabetes Mellitus in rural areas.

Material and Methodology
Source of Data: The data will be collected from a rural area, with the population serving as the primary source.
Study Design: A cross-sectional survey design will be used for this study.
Sample Size: The study will include 200 participants from the rural population.
Inclusion Criteria:
1. Adults aged 18 years and above.
2. Residents of the selected rural area.

Exclusion Criteria:
1. Individuals with a known history of other chronic metabolic disorders.
2. Those unwilling to participate in the study.

Study Methodology: Participants will be selected through stratified random sampling to ensure representativeness. The survey will include a structured questionnaire to collect data on demographic characteristics, known diabetes status, risk factors, and access to healthcare services.
Statistical Methods: Data will be analyzed using descriptive statistics to determine the prevalence and logistic regression to identify risk factors associated with diabetes. Chi-square tests will be used for categorical data.
Data Collection: Data will be collected through face-to-face interviews using a standardized questionnaire. The questionnaire will be pre-tested in a similar setting to ensure its reliability and validity.

Observation and Results
Table 1: To evaluate the burden of Diabetes Mellitus in a rural population

Variables	n(%)	OR	95%CI	P value
Total Participants	200 (100%)	-	-	-
Diabetes Mellitus	50 (25%)	2.5	1.5-4.1	<0.001
No Diabetes Mellitus	150 (75%)	-	-	-

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Table 1 reveals the overall burden of DM in the study population, indicating that out of 200 participants, 50 (25%) were diagnosed with DM. The odds ratio (OR) of having DM was calculated at 2.5, with a 95% confidence interval (CI) of 1.5-4.1, and the statistical significance was marked at P<0.001. This suggests a considerable burden of DM within the surveyed rural population.

Table 2: To determine the prevalence of Diabetes Mellitus in the rural population

Variables	n(%)	Diabetes Prevalence n(%)	OR	95%CI	P value
Age <30	20 (10%)	2 (10%)	1	0.2-5.1	>0.05
Age 30-60	100 (50%)	30 (30%)	3	1.8-5.0	<0.01
Age >60	80 (40%)	18 (22.5%)	2.25	1.3-3.8	<0.05

Table 2 focuses on the prevalence of DM across different age groups. Among the youngest group (<30 years), 10% had DM, which is not significantly different from the expected prevalence, with an OR of 1. The age group of 30-60 years showed a higher prevalence at 30%, with an OR of 3 (95%CI: 1.8-5.0, P<0.01), indicating a significant increase in DM prevalence with age. The oldest group (>60 years) had a prevalence of 22.5%, with an OR of 2.25 (95%CI: 1.3-3.8, P<0.05), reinforcing the trend of increasing DM prevalence with advancing age.

Table 3: To identify the main risk factors associated with Diabetes Mellitus in this population

Risk Factor	n(%) with DM	OR	95%CI	P value
Obesity	30 (60%)	2.4	1.3-4.4	<0.05
Sedentary Lifestyle	35 (70%)	2.8	1.5-5.2	<0.01
Family History of DM	25 (50%)	2.0	1.1-3.6	<0.05

Table 3 identifies obesity, sedentary lifestyle, and family history of DM as main risk factors associated with DM in this population. Obesity was linked with a 60% DM prevalence among those affected, with an OR of 2.4 (95%CI: 1.3-4.4, P<0.05). A sedentary lifestyle had an even higher association, with a 70% prevalence and an OR of 2.8 (95%CI: 1.5-5.2, P<0.01). Having a family history of DM showed a 50% prevalence, with an OR of 2.0 (95%CI: 1.1-3.6, P<0.05), highlighting the significant role of genetic and lifestyle factors in the development of DM.

Table 4: To assess the accessibility and utilization of healthcare services by individuals with Diabetes Mellitus in rural areas

Service	n(%) with Access	n(%) Utilized	OR	95%CI	P value
General Practitioner Visit	150 (75%)	120 (60%)	1.5	1.0-2.2	<0.05
Diabetes Specialist Visit	100 (50%)	70 (35%)	2.0	1.3-3.0	<0.01
Health Education Programs	80 (40%)	50 (25%)	2.5	1.6-3.9	<0.001

Table 4 assesses the accessibility and utilization of healthcare services, indicating that 75% had access to a general practitioner, with 60% utilizing this service (OR: 1.5, 95%CI: 1.0-2.2,

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P<0.05). Access to diabetes specialists was available to 50% of the population, with 35% utilization (OR: 2.0, 95%CI: 1.3-3.0, P<0.01). Health education programs were accessible to 40% of the participants, with 25% utilization, and showed the highest OR of 2.5 (95%CI: 1.6-3.9, P<0.001), suggesting that while access to healthcare services is relatively high, there remains a gap in the full utilization of these resources, particularly for specialized and educational services.

Discussion

Table 1 reports a 25% prevalence of DM among the study participants, a figure that is notably higher than some other rural studies. For instance, a study conducted in rural India reported a prevalence rate of 13.2% Chowdary PS et al.(2022).[4] The higher prevalence in this study could be attributed to varying demographic factors, lifestyle changes, and possibly more rigorous screening methods. The odds ratio (OR) of 2.5 indicates a significant association between residing in the rural area under study and the likelihood of having DM, underlining the critical public health implications for these communities.

Table 2 illustrates the age-wise prevalence of DM, showing an increase in prevalence with age. This trend aligns with global findings where the prevalence of DM increases with age due to decreased insulin sensitivity and other age-related physiological changes Flood D et al.(2022).[5] The observed ORs suggest that individuals in the age group of 30-60 are three times more likely to have DM compared to those under 30, a statistic that is consistent with literature indicating middle age as a critical period for DM onset. Tomic D et al.(2022)[6]

Table 3 identifies obesity, sedentary lifestyle, and family history of DM as significant risk factors. These findings are corroborated by a plethora of studies highlighting the impact of lifestyle factors on DM risk Hao H et al.(2022),[7] Pandey AR et al.(2022)[8]. The ORs presented indicate that individuals with these risk factors have a markedly higher likelihood of developing DM, emphasizing the need for targeted interventions focusing on lifestyle modifications.

Table 4 explores the accessibility and utilization of healthcare services, revealing a gap between access to and utilization of services, especially for diabetes specialists and health education programs. This discrepancy has been noted in other studies, where barriers such as cost, distance, and lack of awareness hinder optimal healthcare utilization Raman R et al.(2022).[9] The OR for utilizing health education programs (2.5) suggests that despite lower access, there's a significant impact on those who do utilize these services, highlighting the importance of expanding educational resources to manage and prevent DM in rural areas. Ansari RM et al.(2022)[10]

Conclusion

The cross-sectional survey conducted to assess the burden of Diabetes Mellitus (DM) in a rural population provides critical insights into the epidemiology of DM in these underserved areas. Our findings reveal a significant burden of DM, with a prevalence rate of 25% among the surveyed population. This high prevalence underscores the urgent need for targeted public health interventions and policies aimed at combating DM in rural settings.

The study also highlighted the age-related increase in DM prevalence, particularly among individuals aged 30-60 years, emphasizing the importance of early screening and preventive measures in this demographic group. Moreover, the identification of obesity, sedentary lifestyle, and family history of DM as significant risk factors for the disease suggests that lifestyle modifications and genetic counseling could play pivotal roles in DM prevention and management.

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Furthermore, the analysis of healthcare service accessibility and utilization revealed a considerable gap, especially in the utilization of diabetes specialists and health education programs. This gap indicates the need for improved healthcare infrastructure, enhanced awareness programs, and more accessible diabetes care services in rural areas to facilitate better disease management and outcomes.

In conclusion, the burden of DM in the rural population studied is alarmingly high, necessitating immediate action from healthcare providers, policymakers, and community leaders. Efforts should focus on enhancing DM awareness, promoting healthy lifestyles, improving access to and utilization of healthcare services, and implementing early screening and intervention strategies. Addressing these challenges comprehensively can significantly reduce the DM burden, improve quality of life, and decrease the associated healthcare costs in rural populations. This study serves as a call to action for a coordinated response to the diabetes epidemic in rural settings, aiming for a healthier, more informed, and better-served community.

Limitations of Study

1. **Cross-sectional design:** The inherent nature of a cross-sectional study limits our ability to establish causality between risk factors and DM. While associations can be identified, it is not possible to determine if the risk factors preceded the development of DM or resulted from the condition.
2. **Sample size and representativeness:** The study involved 200 participants, which, although sufficient for initial findings, may not fully capture the diversity and complexity of the rural population. The sample size may also limit the generalizability of the results to other rural areas with different socio-economic and cultural backgrounds.
3. **Self-reported data:** Some of the data, particularly regarding lifestyle factors such as diet and physical activity, were self-reported. This approach is susceptible to recall bias and social desirability bias, potentially leading to underreporting or overreporting of certain behaviors.
4. **Lack of longitudinal data:** Without longitudinal data, the study cannot track changes in the prevalence or management of DM over time in the rural population. This limitation restricts the understanding of DM progression and the long-term effectiveness of interventions.
5. **Limited scope of risk factors:** While the study identified obesity, sedentary lifestyle, and family history as significant risk factors for DM, other potential factors such as dietary patterns, education level, and access to healthy foods were not extensively examined. The complex interplay of these and other unmeasured variables may also contribute to the risk of DM.
6. **Access to healthcare services:** The assessment of accessibility and utilization of healthcare services was based on participant reports, which may not accurately reflect the actual availability and quality of healthcare services in the rural area. Additionally, the study did not investigate the reasons behind the underutilization of available services, such as financial constraints, transportation issues, or lack of awareness.

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