Health literacy on diabetes mellitus among a working population of Mthatha, Eastern Cape Province, South Africa

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Background. Diabetes mellitus is one of the major killers in low- and middle-income countries. Health literacy of diabetes mellitus is crucial for effective management and prevention strategies. However, socioeconomic factors in Mthatha, South Africa, may limit adult awareness, exacerbating the prevalence of the chronic disease.
Objectives. To assess the level of knowledge of diabetes mellitus among adults in work settings in Mthatha.
Methods. This quantitative cross-sectional study used validated questionnaires to collect data among randomly selected adult workers in Mthatha. The study participants were aged 18 - 60 years, residing and working in Mthatha in the King Sabata Dalindyebo (KSD) subdistrict. Sample size calculations targeted recruiting a minimum of 118 participants. Knowledge adequacy was set at 70%. Helsinki declarations on ethical principles were adhered to throughout the study.
Results. A total of 118 adults, predominantly female (60.2%), with a median age of 34 years and 64.8% with post-matriculation education, participated in the study. The study revealed that only 7.6% of the participants had an adequate knowledge of diabetes mellitus, while 64.4% had a poor knowledge. Only 69.5% of the participants associated excessive sugar consumption with the development of diabetes mellitus, while 44.1% believed that medication was a better option for the control of diabetes than a diet, 34.7% understood that poor blood circulation as a complication was associated with the condition, and only 16.1% identified excessive sweating and shaking as signs of increased blood sugar levels.
Conclusion. Health literacy regarding diabetes mellitus among adult workers in Mthatha is notably low. Improving health literacy knowledge of public health and behaviour modification is crucial to successfully decrease the incidence and number of deaths associated with diabetes mellitus. Innovative approaches tailored for the control of diabetes mellitus in the workplace are needed to balance behaviour and clinical interventions on the management of the condition.

Keywords: adults, diabetes mellitus, health literacy, work settings

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Lack of health literacy of diabetes mellitus results in individuals not recognising the symptoms early, leading to delayed diagnosis and treatment.[1] Poor lifestyle choices such as unhealthy eating behaviours, lack of physical activity and inadequate treatment adherence exacerbate complications of lack of knowledge.[2,3] These factors complicate the management and control of diabetes mellitus, resulting in a rise in prevalence worldwide, thus posing a serious threat of mortality from the illness.[2] Defined as a metabolic condition marked by an elevated blood sugar level (hyperglycaemia) and abnormalities in the metabolism of fat, protein and carbohydrates, diabetic mellitus is brought about by deficiencies in the secretion, action, or both, of the insulin hormone.[4] Uncontrolled blood sugar levels can further lead to adverse conditions such as cardiovascular disease, kidney failure, nerve damage, poor wound healing and even blindness.[5] Some acute metabolic disorders such as ketoacidosis and hypoglycaemia are emergencies resulting from poor knowledge of diabetes mellitus and its risk factors, putting strain on the fiscus and families because of long-term expensive management.[6] There is a significant increase in diabetes mellitus worldwide, mainly in low- and middle-income countries (LMIC).[7] This increase was

noted in 2014, when ~22 million adults in Africa had diabetes and consumed ~11% of global healthcare budgets,[8,9] with South Africa (SA) spending >ZAR140 billion on health in 2021.

In 2021, ~24 million adults between the ages of 20 and 79 years were living with diabetes in African regions.[10] Annually, 4.9 million people die as diabetes cases rise, mainly in LMIC.[8,9] With 80% of the affected population residing in such countries, most develop complications without awareness or knowledge of the disease.[11] In sub-Saharan Africa, where diabetes was once a rare disease, it now affects >12 million people, with 330 000 deaths annually.[12] These figures represent the tip of the iceberg, as screening surveys have shown that many undiagnosed cases of type 2 diabetes mellitus occur in SA, specifically in the Free State Province.[4] The diabetes prevalence for adults aged between 20 and 79 years is ~7.2%, which means ~2.3 million South Africans are living with diabetes.[13]

The Eastern Cape Province, where the current study was conducted, is ranked as the province with the third highest number of diabetes-related deaths,[4] with a prevalence rate of 12.5% among the adult population and a treatment coverage rate of only 34.6%. It was reported that the most significant contributors to problems associated with diabetes in this province were poor knowledge, unhealthy behavioural choices and poor practices.[14] The health system of the province was reported as not adequately capacitated to manage the growing burden of non-communicable diseases,[4] thus requiring improvement to handle the rising diabetes mellitus caseload.[3] To cover the expensive long-term diagnosis and treatment of diabetes, relevant primary healthcare service approaches should be investigated to inform the appropriate package. Therefore, efficacy and lifestyle modification are essential to address the burden of diabetes mellitus. This study aimed to delve into the level of knowledge of diabetes mellitus among the adult population in the work setting in the King Sabata Dalindyebo (KSD) subdistrict.

Methods

The study aimed to delve into the level of knowledge of diabetes mellitus among the adult population in the work setting in Mthatha.

Design

The study adopted quantitative research methods using a cross-sectional design.

Setting

The study was conducted in Mthatha under the KSD subdistrict in the OR Tambo district of the Eastern Cape, SA. Mthatha has an estimated population of 96 114, covering an area of 91.45 km^2.[15] The population is mainly homogenous, consisting of mostly black isiXhosa-speaking people.[16]

Participants

The study participants were adult males and females between the ages of 18 and 60 years residing and working in Mthatha. Adults from all working environments had an equal chance of participating in the study regardless of sex, creed, educational attainment or any form of discrimination. Only consenting and mentally stable adults were included. New employees who worked for <1 year in Mthatha settings were excluded.

Sampling procedure and size

The study adopted a simple random technique to sample participants working in Mthatha. The study used a Kibuacha's formula to determine a sample of 118 participants who worked in the settings of Mthatha, where the expected proportion (P) was 22% (based on SA diabetes prevalence), the confidence level was 95% ($Z\propto$=1.96), the margin of error admitted (e) was 8%, with 15% adjustments for confounders. The following formula was used:

$$n = \frac{Z_{\propto}^2 * P\,(100 - P)}{e^2}$$

Data collection

Approval and arrangements for administering questionnaires from the workplace were obtained from the managers of that sector. Questionnaires were also administered at the convenience of the employees. Data on knowledge were adapted from the validated tool.[17] The tool was translated into isiXhosa (a local language spoken by most of the population) to cater for employees who did not understand English. A specialist in the Department of Linguistics, Walter Sisulu University, performed the translation. The completion of the tool took 20 - 25 minutes.

Data analysis

SPSS version 29.0 (IBM, USA) was used to analyse data. A p-value of ≤0.05 was used to determine the significant value of the variables measured. Therefore, Pearson's χ^2 was used to determine the associations. A 95% confidence interval (CI) was used for inferential statistics, and the t-test was used to compare variables. Charts and tables are used to present the data.

Ethical considerations

The Walter Sisulu University Human Research Ethics Committee granted ethical clearance for the project (ref. no. 018/2023). The KSD municipality held gatekeeping for the study. The fundamental ethical consideration principles in line with the Helsinki Declaration were ensured throughout the study. These included respect for persons, beneficence and justice. The purpose and benefits of the study were explained to the participants. Written consent forms were completed and signed by all participants.

Results

The study comprised 118 adult participants who worked in different settings of the KSD municipality in the OR Tambo district. The participants included males and females, whose age, academic attainment and employment status were recorded.

Sociodemographic characteristics

The sociodemographic characteristics of the sampled population are presented in Table 1. Among the 118 eligible adult participants surveyed from various work settings in Mthatha, the results show a predominance of females (60.2%) compared with males (39.8%). The distribution shows a median age of 34 (interquartile range 28 - 43) years, with most participants falling within the age groups of 22 - 34 years (52.5%). This indicates that the study primarily involved a younger adult working population. There was no statistically significant difference (p=0.978) in level of education across gender (Fig. 1).

Health literacy of diabetes mellitus among the adult population in work settings in Mthatha

The assessment of diabetes mellitus knowledge among participants revealed varying levels of understanding (Table 2). The majority (69.5%) correctly identified that eating too much sugar and other sweet foods is a cause of diabetes. However, only 23.7% correctly recognised that diabetes is caused by failure of the kidneys to keep sugar out of the urine, indicating a misconception about the underlying physiological

cause. Less than half (37.3%) knew that regular exercise decreases the need for insulin or other diabetic medication, while 34.7% knew that diabetes often causes poor circulation. Notably, a statistically significant gender difference was observed in the knowledge about diabetes-related poor circulation (p=0.021), with females (43.7%) demonstrating greater awareness than males (21.3%).

Fig. 2 shows the mean diabetes knowledge scores among male and female participants and their 95% CIs. While the mean knowledge score appears slightly higher among females than males, the error bars (which represent the margin of error around the means) overlap substantially. This overlap, combined with Student's t-test (p>0.05) of 0.277, suggests that the difference in knowledge scores between genders is not statistically significant.

Fig. 3 (pie chart) illustrates the distribution of diabetes knowledge levels among participants. Most participants (64.4%) demonstrated poor knowledge of diabetes mellitus. A smaller proportion (28.0%) had an average knowledge, while only 7.6% of the participants exhibited a good knowledge.

There was no significant association (p=0.629) between gender and knowledge of diabetes, although more females (38.0%) than males (31.9%) were knowledgeable (Fig. 4).

Discussion

Risk factors for diabetes mellitus

The study revealed that more than two-thirds (69.5%) of the participants correctly identified that excessive sugar intake can lead to diabetes. This is an encouraging finding, indicating a degree of awareness; however, the variance reflects areas requiring attention regarding public health messaging about dietary risks. This finding is consistent with that in the study by Clark *et al.*[18] among an adult population. It is indeed concerning that only 37.3% of the participants correctly understood that regular exercise would decrease the need for insulin in their bodies. This result indicates a critical misconception of unhealthy behaviour such as physical inactivity, which is considered to be core in the management of diabetes mellitus. This outcome is aligned with that of

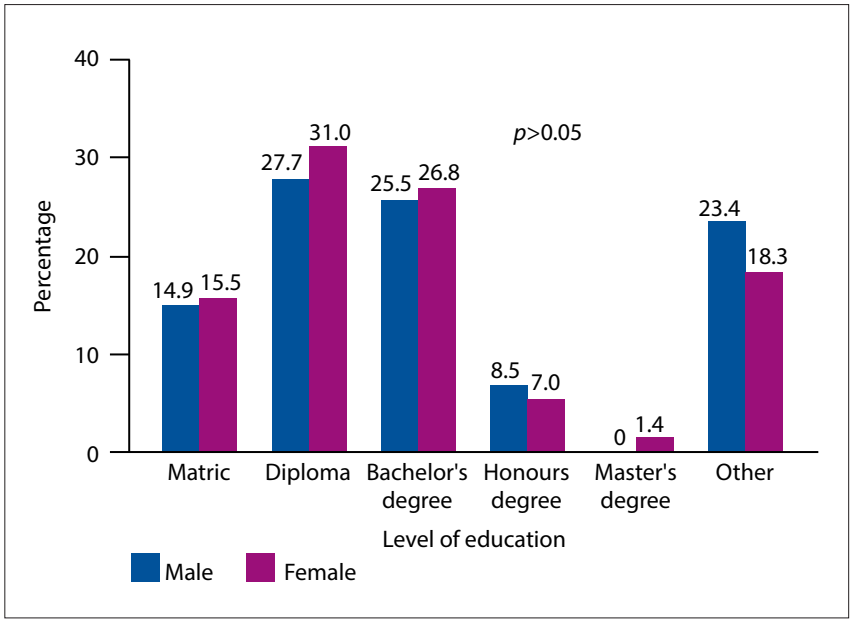

Fig. 1. Comparison of the level of education by gender among 118 of the adult working population in Mthatha.

Table 1. Sociodemographic characteristics of the adult population in work settings at King Sabata Dalindyebo subdistrict

Variables	Category	*n* (%)*
Gender	Female	71 (60.2)
	Male	47 (39.8)
Age group, years	22 - 34	62 (52.5)
	35 - 44	30 (25.4)
	45 - 54	20 (16.9)
	55 - 61	6 (5.1)
Age, median (IQR)		34 (28 - 43)
Race	Black African	118 (100.0)
Level of education†	Matric	18 (15.3)
	Diploma	35 (29.7)
	Degree	31 (26.3)
	Honours degree	9 (7.6)
	Master's degree	1 (0.8)
	Other	24 (20.3)
Workplace	Department of Employment and Labour	24 (20.3)
	OR Tambo Health District	21 (17.8)
	Mthatha Health Club	21 (17.8)
	Mthatha Christian High	20 (16.9)
	Walter Sisulu University	18 (15.3)
	South African Police Service	14 (11.9)

IQR = interquartile range.
*Except where otherwise indicated.
†Other level of education: matric and Private Security Industry Regulatory Authority (PSIRA) (n=7, 70.8%); diploma and Psira (4.2%); matric and computer certificate (n=6, 25%).

Table 2. Gender-based comparison of diabetes mellitus knowledge among the adult working population at King Sabata Dalindyebo subdistrict

	All		Male		Female		
	Correct, *n* (%)	Incorrect, *n* (%)	Correct, *n* (%)	Incorrect, *n* (%)	Correct, *n* (%)	Incorrect, *n* (%)	*p*-value
Eating too much sugar and other sweet foods is a cause of diabetes	82 (69.5)	36 (30.5)	32 (68.1)	15 (31.9)	50 (70.4)	21 (29.6)	0.948
Diabetes is caused by failure of the kidneys to prevent sugar from entering the urine	28 (23.7)	90 (76.3)	8 (17.0)	39 (83.0)	20 (28.2)	51 (71.8)	0.241
Regular exercise decreases the need for insulin or other diabetic medication	44 (37.3)	74 (62.7)	18 (38.3)	29 (61.7)	26 (36.6)	45 (63.4)	1.000
Diabetes often causes poor circulation	41 (34.7)	77 (65.3)	10 (21.3)	37 (78.7)	31 (43.7)	40 (56.3)	0.021
The way I prepare my food is as important as the foods I eat	95 (80.5)	23 (19.5)	40 (85.1)	7 (14.9)	55 (77.5)	16 (22.5)	0.430
Diabetes can damage my kidneys	46 (39.0)	72 (61.0)	14 (29.8)	33 (70.2)	32 (45.1)	39 (54.9)	0.141
Diabetes can cause loss of feeling in my hands, fingers and feet	65 (55.1)	53 (44.9)	24 (51.1)	23 (48.9)	41 (57.7)	30 (42.3)	0.599
Shaking and sweating are signs of high blood sugar	19 (16.1)	99 (83.9)	6 (12.8)	41 (87.2)	13 (18.3)	58 (81.7)	0.585
Frequent urination and thirst are signs of low blood sugar	9 (7.6)	109 (92.4)	3 (6.4)	44 (93.6)	6 (8.5)	65 (91.5)	1.000*
A diabetic diet consists mainly of special foods	68 (57.6)	50 (42.4)	29 (61.7)	18 (38.3)	39 (54.9)	32 (45.1)	0.590

* Fisher's exact test; statistics not computed.

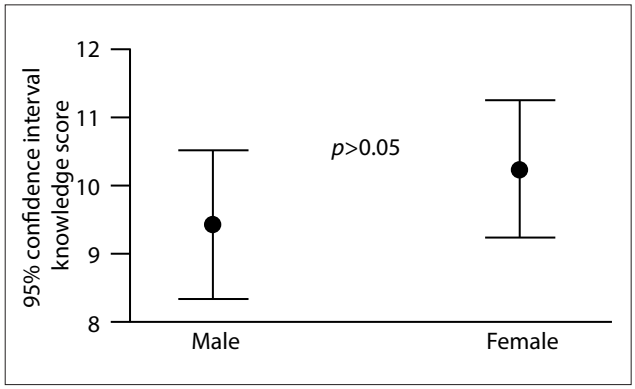

Fig. 2. Gender differences in diabetes mellitus knowledge scores.

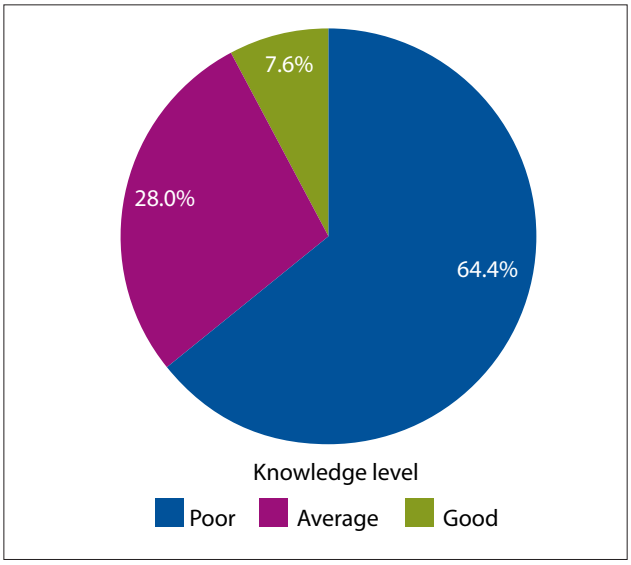

Fig. 3. Knowledge level of diabetes mellitus among study participants.

Małkowska,[19] who reported that physical activity is associated with insulin sensitivity. In another study, it was reported that healthcare providers can assist patients with checking their blood sugar level before, during and after exercise to note how their body reacts to physical activity.[20] The outcome of research conducted in Ghana confirmed the relationship between regular exercise and insulin or other diabetic medication needs among patients with diabetes.[21] Another research study reported numerous benefits of exercising.[22] However, it is important to note that one must be aware of how physical activity may impact medication needs.[22] Furthermore, health professionals were found to support that frequent blood glucose monitoring enables people with diabetes to safely and easily fit physical activity into their daily lives, while paying proper attention to their medication needs.[23]

The knowledge surrounding diabetes complications varied, with only 34.7% recognising that diabetes can cause poor blood circulation. The inadequacy of knowledge can result in undesirable health outcomes, as individuals may delay the activation of preventive measures. Notably, a statistically significant gender difference was observed in the knowledge about diabetes-related poor circulation (p=0.021), with females (43.7%) demonstrating greater awareness than males (21.3%). A study performed in Cape Town, SA, suggested that it is not only the maintenance of blood sugar levels that is important for diabetic patients but also the maintenance of their cardiovascular health for better circulation.[24] Individuals should address problems pertaining to smoking, unhealthy weight and sedentary behaviours to maintain their health and wellbeing.[24] A Ghanaian study recommended improving cardiovascular health by making lifestyle changes – individuals with diabetes should reduce their risk of developing complications related to poor circulation.[25] A supporting finding affirms the necessity for healthcare providers to make patients aware of the link between diabetes and poor

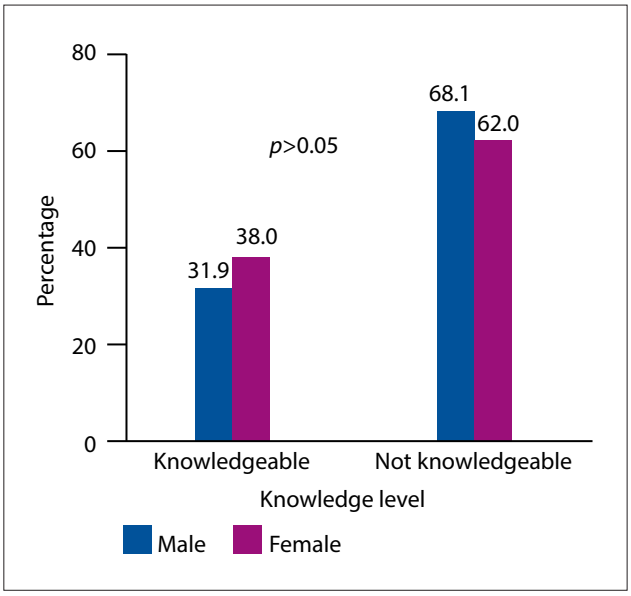

Fig. 4. Knowledge level stratified by gender.

circulation and to work with patients to develop a comprehensive treatment plan that addresses this issue.[26]

Only 23.7% correctly recognised that diabetes results from the inability of the kidneys to keep sugar out of the urine, indicating a misconception about the underlying physiological cause. This finding is often clouded by myths not supporting the view that suggested that it could be better managed by extensive health education and awareness, which would be instrumental in removing myths and misconceptions regarding diabetes.[27] Moreover, healthcare providers are well trained in motivational interviewing practices, which can enhance patients' understanding of their condition and support them in making informed health decisions.[28] It is essential for individuals to be actively involved in managing their diabetes treatment, as this allows healthcare providers to dispel myths and promote a clearer understanding of the true causes of this chronic condition.[29]

Results indicated that most participants claimed that their food preparation is as important as the foods they eat. A supporting study for these findings emphasises that home cooking allows individuals to have greater control over the quality and nutrition of their food.[30] Consumers were advised to limit their sugar intake, unhealthy fats and artificial preservatives commonly found in processed foods.[31] A hands-on approach to cooking enables individuals to take responsibility and control over their food intake.[29] Reicks *et al.*[31] argue that consumers should foster a better relationship with food and implement more mindfulness in their dietary choices. Larson *et al.*[32] emphasised that increasing health perception and lifestyle awareness can encourage individuals to pursue healthier outcomes.

The results show that most of the participants in the study were aware that diabetes is associated with kidney damage. These findings are similar to those of another study that recommended that the prevention of kidney damage in people with diabetes is complex.[34] There should be tight control of blood glucose levels with a combination of medication, diet and exercise. Regular monitoring of renal function with urine and blood tests is essential for early detection of abnormalities and maintenance of kidney health.[35] A study conducted in Zimbabwe emphasised the importance of co-operation between healthcare providers and people with diabetes in reducing the risk of damage to their kidneys, and hence improving health outcomes.[36]

The results of the current study suggest that diabetes mellitus may lead to a loss of sensation in the hands, fingers and feet among affected individuals. Similar findings were found in another SA study, which confirmed that the management of blood sugar levels is crucial for maintaining nerve health in affected individuals.[37] The mechanisms involve practising good foot care, wearing comfortable shoes, avoiding smoking and maintaining a healthy weight.[38] This study further reported an association between diabetes and loss of sensation in the individuals' hands, fingers and feet, which signifies the profound impact of this chronic illness on a person's daily life. This aspect was defined as a mode of advancing the diabetic level. A study conducted in the Eastern Cape, SA, confirmed that awareness campaigns that are focused on the significance of early detection and management of diabetes can effectively enhance health and wellbeing outcomes for individuals with this condition and mitigate the risk of complications such as neuropathy.[39]

In managing complications associated with diabetes mellitus, the findings of the current study indicate that a significant majority of participants concurred that an effective diabetic diet should primarily incorporate specialised food options. This understanding introduces complexities regarding the management of diabetes, potentially overburdening the general population in their efforts to provide effective support for individuals diagnosed with diabetes. Conversely, recent research findings indicate that a diet suitable for managing diabetes does not necessitate the inclusion of specialised or costly foods. Rather, it emphasises the importance of making healthier dietary choices and implementing portion control as essential strategies for maintaining optimal blood glucose levels.[40]

The findings of this study reflect an inadequate health literacy of factors associated with the development, prevention and management of diabetes mellitus. The findings also reflect the risk of potential strain on the health system, as costs related to the maintenance of diabetic patients are high, with their quality of life negatively impacted if not taken care of. In a Mexican study of patients with type 2 diabetes, it was noted that there was an association between knowledge inadequacy and poor control of blood sugar levels.[41] Staff attitudes, messaging or social determinants of health were factors associated with the lack of diabetes mellitus knowledge.[42]

In our study, women have been reported as having better health literacy of diabetes mellitus than their male counterparts.[43] Sękowski *et al.*,[42] in a Polish study, indicated that females demonstrated a better understanding of diabetes mellitus. This finding highlights the necessity for a comprehensive educational intervention in the community to improve the population's ability to manage their condition independently. However, gender differences should be considered to ensure that males are effectively engaged and reached when designing diabetes education initiatives.[44]

The study has displayed health disparities among the working population – the country's economic drivers. If this population is at risk of chronic illness and lacks awareness regarding the management of their condition, the nation may be confronted with an adverse health trajectory. While other organisations offer general diabetes education and training, there is a lack of individualised support tailored to the specific needs of employees with diabetes.[45,46] Employees often face barriers such as a private space for insulin administration and challenges regarding the managerial understanding of diabetes management.[45]

Study limitations

The study was conducted in a relatively small sample size of workers, which may be a limitation. Consequently, the results may not fully capture the broader experience of the workforce or provide a comprehensive understanding of diabetes mellitus.

Recommendations

It is recommended that organisations should implement personalised diabetes management programmes. These should include dedicated support systems and targeted manager training to address the unique needs of employees with diabetes and to enhance workplace inclusivity and health outcomes.

Study implications

Future research must include larger and more diverse samples for it to be effective and complete. This will validate the findings and also provide a more in-depth understanding of the phenomenon under investigation. To achieve more effective and equitable outcomes, policies should be based on comprehensive and diverse research data. This would encourage policymakers to utilise proven findings that inform decision-making processes. To meet the needs of the entire workforce, there should be ongoing research that addresses the complexity of societal challenges and involves diverse demographic groups.

Conclusion

Findings from this study show that health literacy regarding diabetes mellitus is alarmingly low, and higher educational levels do not guarantee an improved understanding among study participants only. The contribution of healthcare workers to enhancing community understanding of the disease remains unclear when assessed through the lens of the community's overall knowledge level. Reconfiguring policy on messaging approaches is critical in closing the gaps identified in diabetes literacy. The allocation of adequately trained staff to educational initiatives and the establishment of a dedicated team focused on health literacy are urgent. Organisations can enhance the wellbeing of their employees living with diabetes by offering comprehensive education on the condition and conducting regular training sessions where health initiatives are promoted. By fostering a supportive work environment, they empower individuals to better understand and manage their health, ultimately improving productivity and quality of life.

Data availability. The datasets generated and/or analysed during the current study are not publicly available due to research regulations, the Protection of Personal Information Act, and the confidentiality agreement with participants, but are available from the corresponding author by reasonable request.

Declaration. The research for this study was done in partial fulfilment of the requirements for LM's MSc (Health Promotion) degree at Walter Sisulu University.

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Author contributions. Conceptualisation: LM and SCN; methodology: ABAN, MKN and NVK; software: SAM; validation: SCN, ABAN and MKN; formal analysis: SAM and MKN; investigation: LM, MKN and SCN; resources: SCN and WWC; data curation: LM and MKN; writing of original draft: LM, NVK and MKN; writing of review and editing: SCN and SAM; visualisation: LM and SCN; supervision: SCN; project administration: SCN and SAM; funding acquisition: WWC. All authors have read and agreed to the published version of the manuscript.

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