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Knowledge, Awareness of Diabetes Mellitus in Nurses Working in Tertiary Care Hospital of Peshawar

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ABSTRACT

According to the global burden of disease (2021) statistics, 529 million people were living with diabetes with the incidence of 6.1% globally. With increase in diabetes prevalence, nurses need comprehensive knowledge for effective patient care. Nurses, as part of multidisciplinary teams, play a crucial role in patient education for lifelong diabetes management. **Objective:** To assess the nurses' knowledge awareness about diabetes mellitus working in tertiary care hospital in Peshawar, Khyber Pakhtunkhwa, Pakistan. **Methods:** This was cross-sectional study conducted in the tertiary care hospital of Peshawar, levels of knowledge were evaluated using the 40-items Knowledge score questionnaire. Additionally, outlined demographic characteristics of the participants. Pearson correlation was applied to assess associations between nurses' knowledge scores and relevant demographic variables. **Results:** Among 280 nurses, the average knowledge score was 36.11 ± 1.78 (90.3%) on a 100-point scale. While participants of the study were correctly answered the acute and chronic complications of DM such as slow wound healing, damage of (Kidney, Nerve, Foot), Diabetic ketoacidosis and Hyperosmolar hyperglycemic state were 92.1%, 85.4%, 87.9%, 98.2%, 92.9% and 72.9% respectively. Moreover, a statistical difference in knowledge scores was observed between nurses with and without a family history of diabetes (P 0.00). **Conclusions:** Nurses have shown good knowledge on the various aspects of diabetes mellitus. However, there were some areas which need improvement. The general knowledge was better, but the score on dietary management, role of somatostatin in glucose regulation, renal and eye complications, and hyperosmolar hyperglycemic state was below 90%.

INTRODUCTION

Diabetes Mellitus (DM) is a chronic metabolic disorder caused by genetics and/or acquired insulin deficiency or insensitivity/resistance, results in the increased level of glucose in the blood, leading to complications affecting blood vessels and nerves [1]. There are ranges of symptoms based on the types of diabetes mellitus such as polyuria, polydipsia, weight loss, increased appetite [2]. Diabetes Mellitus had multifaceted threat which goes beyond the individual level and has profound economic burden on health system and national economy. According to the global burden of disease (2021) statistics, 529 million people were living with diabetes with the incidence of 6.1% globally [3]. The diabetes prevalence in Pakistan is 16.98%, approximately 220.9 million populations (2020), predicted cost spent 495.0 billion PKR, roughly constituting 73.7% of the country's total annual health expenditure of 671.4 billion PKR [4]. In European countries, nurses were legally permitted to treat and educate diabetic patients, while in Asian countries, doctors play a major role in treatment. Nursing responsibilities increases to enhance diabetic care. Nurse-led clinics for Diabetes Mellitus management are a new method to effectively ameliorate the management of disease [5, 6]. Health-care workers, including nurses, play a central role in providing education on diabetes prevention, diagnosis, and management to patients and their families [7]. With increase in diabetes prevalence, nurses need comprehensive knowledge for effective patient care. Previous studies reveal inadequate understanding among hospital staff, especially nurses, resulting in suboptimal care [8]. Optimal diabetes care

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requires not only nurses' knowledge but also increase self-management awareness in patients [9]. Nurses, as part of multidisciplinary teams, play a crucial role in patient education for lifelong diabetes management [10]. There were different Studies conducted showing deficiency in the knowledge among nurses in different areas of diabetic care and management in various countries [2]. Australasian studies indicate about 50% of nurses lack awareness of diabetes complications, and in Korea about 80% nurses have poor dietary management of diabetes [11-13]. These findings underscore insufficient knowledge across diverse healthcare settings [9]. Nurses having good diabetic knowledge can play a significant role by giving proper education to the diabetic patients with the correct knowledge they require for their care and management of disease both in healthcare and community areas [14, 15].

In undertaking this research on nurses' knowledge about DM, our primary aim was to address a critical gap in understanding the level of knowledge among nurses regarding DM. Finding of this research were anticipated to have significant implications for both nursing practice and patient outcomes. Through this investigation, it was observed to have the way for informed strategies that empower nurses, strengthen healthcare systems, and ultimately elevate the standard of diabetes care within our community.

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METHODS

A descriptive cross-sectional study was conducted at the tertiary care hospital in Peshawar, Pakistan, between July 2023 and Dec 2023. The study population comprised full-time registered nurses in the hospital. All interns, students, and trainee nurses were excluded from the study. Ethical approval was obtained from the Peshawar Institute of Cardiology (Ref No. IRC/23/37) prior to data collection. Questionnaires were distributed in nurses in different units using a simple random sampling technique during morning, evening, and night shifts. Majority of the questionnaires were completed during the evening shift, which was deemed more convenient and stable compared to the morning shift. The sample size for the study was calculated using G power, with a medium effect size of 0.30 and a 95% confidence level, resulting in a sample size of N=280. Participants were given the authority to fill out the questionnaire at any time during their duty hours after providing verbal informed consent and considering other agreed-upon ethical considerations. Participants were requested to fill and return the questionnaires to the concerned unit team leader. The tools of the study were predefined, structured, and consisted of close-ended questions. In the first portion of the questionnaire, 5 questions addressed various demographics of the participants, including sex, age, marital status, and other relevant qualifications. Furthermore, the questionnaire included 40 questions based on updated guidelines. The nurses' knowledge was assessed in six basic areas: screening or general questions (1), symptoms (3), pathophysiology (12), diagnosis (2), risk factors (4), complications (11), and management (8). To calculate the knowledge score, a scoring system was used: 1 point or 2.5% for each correct answer and 0 points for each incorrect answer, with a total maximum mean score of 40 or 100%. In the knowledge section, scores above 90% indicated excellent, 80-89% good, and below 80% indicated poor knowledge. Seven categories of knowledge were outlined based on respondents' scores. Registered nurses from various medical and surgical units participated. The data were entered and analyzed using SPSS version 25.0, with descriptive and inferential statistics applied. Pearson correlation was used to determine the strength of the association between the knowledge score and sociodemographic variables, including sex, age, education, and diabetes-related variables (knowledge, having diabetes mellitus, and family history). Student's t-tests evaluated differences in knowledge scores among categorical variables. Results were considered significant at a 95% confidence interval with 2-tailed p-values ≤ 0.05.

RESULTS

The samples were taken from the tertiary care hospital of the capital city of the province (Peshawar), Khyber-Pakhtunkhwa, Pakistan. The eligible study participants (N=280) were requested to participate, resulting in a 100% response rate. Among them, the majority were male 155 (55.54%), followed by female 125 (44.6%). The participants' ages ranged between 20-30 years 156 (55.7%), 31-40 years 79 (28.2%), and 41-50 years 45 (16.1%). Most participants have a qualification of Diploma in Nursing (53.6%), followed by a bachelor's in nursing (BSN) (43.6%) and a master's in nursing (MSN) (2.9%) (Table 1).

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Table 1: Demographic Characteristics of the Participants

S.No.	Variables		Frequency (%)
1	Sex	Male	155 (55.4%)
		Female	125 (44.6 %)
2	Age	20-30 Years	156 (55.7%)
		31-40 Years	79 (28.2%)
		41-50 Years	45 (16.1%)
3	Qualification	Diploma in Nursing	150 (53.6%)
		BSN	122 (43.6%)
		MSN	08 (2.9%)
4	Marital Status	Single	129 (46.1%)
		Married	151 (53.9%)

Among the total nurses, only 29 individuals reported a history of diabetes mellitus (36.30 ± 1.60) (P=0.00). Most of the nurses (n=250) asserted did not have a family history of DM, 30 nurses were the opposite. The following variables such as positive history of DM, family history of DM, qualifications and having knowledge about DM were strongly significant regard to diabetic knowledge mean score (P<0.05). Those nurse who have reported positive history of DM were more knowledgeable (mean 36.27 ± 1.71, correspondence 90.7%) compared to no history of DM. The qualification was significant, mean score of MSN higher 36.54 ± 1.70 than BSN 35.88 ± 1.46 and diploma 35.68 ± 1.83 (P=0.001). On contrary, the two variables, sex and age were not significant P>0.05 (Table 2).

Table 2: Diabetic Knowledge Score of the Nurses with Respect to their Demographic Characteristic

Variables	Frequency (%)	Mean ± SD	p-Value
Sex			
Male	155 (90.5%)	36.20 ± 1.72	0.135
Female	125 (89.7%)	35.87 ± 1.93	
Age			
20-30 Years	156 (90.5%)	36.21 ± 1.77	0.089
31-40 Years	79 (90%)	36.01 ± 1.80	
41-50 Years	45 (88.6%)	35.42 ± 1.93	
Having Diabetes Millets			
No	251 (84.4%)	33.93 ± 1.60	0.001
Yes	29 (90.8%)	36.30 ± 1.67	
Family history			
No	250 (85.6%)	34.23 ± 1.72	0.001
Yes	30 (90.7%)	36.27 ± 1.71	
Qualification			
Diploma in Nursing	150 (89.2%)	35.68 ± 1.83	0.001
BSN	122 (89.7%)	35.88 ± 1.46	
MSN	08 (91.4%)	36.54 ± 1.70	
Nurses claim about Knowledge of DM			
Claimed (Yes)	275 (90.3%)	36.11 ± 1.78	0.001
Claimed (No)	5 (83%)	33.20 ± 2.59	

The participants exhibited a higher level of understanding about DM when responding to inquiries about general (knowledge about DM), pathophysiologic, risk factors, complication, management, and symptoms (table 3). Responders correct answers related to pathophysiologic factors were regulating glucose level (insulin 87.5%, glucagon 87.1%, oxytocin 91.8%, somatostatin 85.4%, thyroxin 89.6), insulin secrete by (pancreas 93.2%, liver 87.1%, stomach 98.2%), DM is a metabolic disorder 97.1%, DM is a condition of high blood sugar 98.9%, resistance to insulin is a cause of DM 98.6%, destruction of beta cells is a cause of DM 96.4%. Majority of the participants correctly responded the risk factors of DM were age 96.8%, obesity 97.9%, family history 99.6 and pregnancy 98.2%. The participants of the study were aware relating to the acute and chronic complications of DM such as slow wound healing, damage of (Kidney, Nerve, Foot), Diabetic ketoacidosis and Hyperosmolar hyperglycemic state. They were accurately responded the complication of DM with 92.1%, 85.4%, 87.9%, 98.2%, 92.9% and 72.9% respectively. The most frequently incorrect answered by respondents was Hyperosmolar hyperglycemic state (27.1%, n=76). Majority of the participant correctly reported the nerves damage is common complication associated with diabetes mellites. More than ¾ (98.2%) nurses correctly answered about diabetes foot care is important and agreed that the best way to prevent foot ulcer is to wear loose shoes, prevent from further damage and regular wash. The participants were also investigated about the management of DM, most of the participants correctly answered the treatment option for DM were (insulin n=273,97.5%, oral glycemic agent n=261,93.2%, exercise n=248,88.6% and diet n=251,89.6%), exercise is important for DM patients (n= 271,96.8%), nurse will advise the care of (feet n=271,96.8%, regular exercise n=269, 96.1% and carry sweet when out from the home n=251, 89.6%). Majority of the nurses correctly responded the symptoms of DM were the frequent thirst 91.8% and urination 97.1%. The symptoms of which was least correctly answered was increase hunger has occurred in DM patients 90.4%. In all participant majority were well knowledgeable about the risk factors such as: age 96.8%, obesity 97.9%, family history of DM 99.6% and pregnancy 98.2% (Table 3).

Table 3: Frequency Percentage Distribution of Correct Answers to Questionnaire Items (n=280)

S. No.	Items	Frequency and Percentage of Correct Answers N (%)
General/Screening		
1	Knowledge about DM	275 (98.2%)
Pathophysiology		
2	Insulin Regulated Glucose Level	245 (87.5%)
3	Glucagon Regulated Glucose Level	244 (87.1%)
4	Oxytocin Regulated Glucose Level	257 (91.8%)
5	Somatostatins Regulated Glucose Level	239 (85.4%)
6	Thyroxin Regulated Glucose Level	251 (89.6%)
7	Liver Secreted Insulin	244 (87.1%)
8	Pancreas Secreted Insulin	261 (93.2%)
9	Stomach Secreted Insulin	275 (98.2%)

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10	DM was a Metabolic Disorder	272 (97.1%)
11	DM was a Condition of High Blood Sugar	277 (98.9%)
12	Destruction of Beta Cells was a Cause of DM	270 (96.4%)
13	Resistance to Insulin was a Cause of DM	276 (98.6%)
Risk factors		
14	Age was a Risk Factor for DM	271 (96.8%)
15	Obesity was a Risk Factor for DM	274 (97.9%)
16	Positive Family History was a Risk Factor for DM	279 (99.6%)
17	Pregnancy was a Risk Factor for DM	275 (98.2%)
Diagnostic		
18	Fasting Glucose Diagnostic Criteria for DM	251 (89.6%)
19	Random Glucose Diagnostic Criteria for DM	247 (88.2%)
Symptoms		
20	Increased of Thirst was the Symptom of DM	257 (91.8%)
21	Frequent Urination was the Symptom of DM	272 (97.1%)
22	Increase of Hunger was the Symptom of DM	253 (90.4%)
Complication		
23	Slow Wound Healing was the Complication of DM	258 (92.1%)
24	Diabetic Ketoacidosis was an Acute Complication of DM	260 (92.9%)
25	Hypoglycemia was an Acute Complication of DM	259 (92.5%)
26	Hyperosmolar Hyperglycemic State was an Acute Complication of DM	204 (72.9%)
27	Kidney Damage was a Chronic Complication of DM	239 (85.4%)
28	Eye Damage was a Chronic Complication of DM	246 (86.1%)
29	Nerve Damage was a Chronic Complication of DM	246 (87.9%)
30	Foot Ulcer was a Chronic Complication of DM	275 (98.2%)
Management		
31	Insulin was a Treatment Option for DM	273 (97.5%)
32	Oral Hypoglycemic was a Treatment Option for DM	261 (93.2%)
33	Exercise was a Treatment Option for DM	248 (88.6%)
34	Diet was a Treatment Option for DM	251 (89.6%)
35	Exercise was a Necessary for DM Patients	271 (96.8%)
36	Effect of Exercise on Blood Glucose Level	258 (92.1%)
37	Low Fatty and Sugar Diet was a Nurse Advise to a DM Patient	266 (95%)
38	Care for their Feet was a Nurse Advise to a DM Patient	271 (96.8%)
39	Regular Exercise was a Nurse Advise to a DM Patient	269 (96.1%)
40	Carry Sweets when they out was a Nurse Advise to a DM Patient	251 (89.6%)

DISCUSSION

This study examines nurse's awareness about Diabetes Mellitus in Peshawar's tertiary care hospitals, emphasizing their critical role in patient education, disease management, and healthcare delivery. Despite their pivotal role, our findings indicate negative association between nurses' age and diabetes knowledge, suggesting tenure does not always correlate with expertise due to increased administrative duties and focus on non-clinical qualifications. Similar study has findings were observed in a study conducted in Saudi Arabia [16]. Having positive history of diabetes mellitus, history of familial diabetes, qualification, and self-reported knowledge of diabetes were found to be highly significant regarding the mean score of diabetic knowledge. Nurses having master's in nursing have higher scores as compared to BSN and general nursing. Provision of knowledge and education cannot give guarantee of quality nursing practice, but knowledge is an important precursor of attitude and behavior and the impact of knowledge on the people attitude and behavior is well understood. There is a relationship between nurses' educational performance and their clinical and practical competency [10]. In the current study, there was a significant difference in the knowledge score between males and females. Males have more mean knowledge score as compared to females. This is similar to the study conducted in Riyadh where the perceived knowledge of males was higher than females, and it is in contrast to the other study conducted in Saudi Arabia [13, 17]. The nurses having positive family history has good knowledge score of diabetes. Reasonably, they were much aware of diabetes related treatment and complication. There was no significant difference in the Nigeria study on the nurse's knowledge about diabetes with respect to various demographics like age, gender, qualification, perceived knowledge, and ward practices of the nurses regarding the diabetes [18, 19]. This study revealed a generally high level of knowledge of diabetes mellitus among nurses. The mean score of knowledge was 36.11 ± 1.78, corresponding to 90.3%. However, none of these nurses were able to correctly answer all the questions. In this study, most of the nurses have good knowledge about diabetes (98.2%), but it contrasts to the study conducted in US, the reason might be the lack of collaboration between physician and nurses on the diabetes management and care [20]. Management of Diabetes among other non-communicable diseases has recently drawn substantial attention due to its associated complications and socio-economic impact. Lack of knowledge among health care providers has been found to be one of the major obstacles in the management of hyperglycemia [18, 19]. The participants of the study were aware of relating to the acute and chronic complications. They accurately responded the complication of DM. This is like to the findings where the nurses have reported several complications of type 2 diabetes mellitus including blindness, renal disease, and cardiac disease. Majority of the nurses reported tiredness and weakness as a complication. However, a very few perceived diabetes as a serious disease [7]. In managing diabetes, nurses have achieved scores of over 90% in most components, yet less than ninety percent in exercise treatment, dietary management, and the importance of carrying sweets.

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Education is crucial in each diabetes case. Similar studies indicate nurses' limited knowledge on diets due to cultural beliefs; many used to think diabetic diets should be sugar-free, whereas now balanced diets with low fats and high protein were recommended [20, 21]. Effective management requires a collaborative approach involving patients, families, and healthcare providers to build essential knowledge and skills, promoting self-care. Conversely, another study found registered nurses scored poorly, 41-72%, in diabetes management [22]. Nurses play a pivotal role and should possess adequate skills and knowledge for standardized treatment. Recent literature suggests trained nurses were increasingly replacing doctors in diabetes management [23].

CONCLUSIONS

Nurses have shown good knowledge on the various aspects of diabetes mellitus.However, there were some of the areas which need improvement.The general knowledge was better, but score on dietary management, role of somatostatin in glucose regulation, renal and eye complications, and hyperosmolar hyperglycemic state was below 90%. The current study has identified some deficiencies in the areas of knowledge which need to be enhanced among nurses to improve the care of patients. It is advisable to arrange training sessions and other educational activities for the nurses to develop and update their knowledge level.The hospitals may provide opportunities for nurses to work with senior clinicians to enhance the practices of diabetes.

Authors Contribution

Conceptualization: IR
Methodology: IR, AD, IA
Formal analysis: IR, NU
Writing, review and editing: IR, NU

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

The authors declare no conflict of interest.

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REFRENCES

[1] Amin N. An overview of diabetes mellitus; types, complications, and management. International Journal of Nursing Science Practice and Research. 2018 Apr; 4(1): 119-24. doi: 10.37628/ijnspr.v4i1.645.

[2] Antar SA, Ashour NA, Sharaky M, Khattab M, Ashour NA, Zaid RT, Roh EJ, Elkamhawy A, Al-Karmalawy AA. Diabetes mellitus: Classification, mediators, and complications; A gate to identify potential targets for the development of new effective treatments. Biomedicine & Pharmacotherapy. 2023 Dec 1;168:115734.

[3] Ong KL, Stafford LK, McLaughlin SA, Boyko EJ, Vollset SE, Smith AE *et al*. Global, regional, and national burden of diabetes from 1990 to 2021, with projections of prevalence to 2050: a systematic analysis for the Global Burden of Disease Study 2021. The Lancet. 2023 Jul; 402(10397): 203-34. doi: 10.1016/S0140-6736(23)01301-6.

[4] Butt MD, Ong SC, Wahab MU, Rasool MF, Saleem F, Hashmi A *et al.* Cost of illness analysis of type 2 diabetes mellitus: the findings from a lower-middle income country. International Journal of Environmental Research and Public Health. 2022 Oct; 19(19): 12611. doi: 10.3390/ijerph191912611.

[5] Dailah HG. The Influence of Nurse-Led Interventions on Diseases Management in Patients with Diabetes Mellitus: A Narrative Review. InHealthcare 2024 Jan 30 (Vol. 12, No. 3, p. 352). MDPI.

[6] Carey N and Courtenay M. An exploration of the continuing professional development needs of nurse independent prescribers and nurse supplementary prescribers who prescribe medicines for patients with diabetes. Journal of Clinical Nursing. 2010 Jan; 19(12): 208-16. doi: 10.1111/j.1365-2702.2009.02943.x.

[7] Abdirahman HA, Hassan T, AbuAlUla NA, Jacobsen KH. Knowledge and attitudes about type 2 diabetes among female nursing students in Saudi Arabia. World Medical & Health Policy. 2022 Mar; 14(1): 47-53. doi: 10.1002/wmh3.413.

[8] Nikitara M, Constantinou CS, Andreou E, Diomidous M. The role of nurses and the facilitators and barriers in diabetes care: a mixed methods systematic literature review. Behavioral Sciences. 2019 Jun; 9(6): 61. doi: 10.3390/bs9060061.

[9] Chan MF and Zang YL. Nurses' perceived and actual level of diabetes mellitus knowledge: results of a cluster analysis. Journal of Clinical Nursing. 2007 Jul; 16(7b): 234-42. doi: 10.1111/j.1365-2702.2006.01761.x.

[10] Engvall JC, Padula C, Krajewski A, Rourke J, Gomes McCillivray C, Desroches S *et al.* Empowering the Development of a Nurse-Driven Protocol. Medsurg Nursing. 2014 May; 23(3).

[11] Park KA, Cho WI, Song KJ, Lee YS, Sung IS, Choi-Kwon SM. Assessment of nurses' nutritional knowledge regarding therapeutic diet regimens. Nurse education today. 2011 Feb 1;31(2):192-7.

[12] Daly B, Arroll B, Sheridan N, Kenealy T, Scragg R. Diabetes knowledge of nurses providing community care for diabetes patients in Auckland, New Zealand. Primary Care Diabetes. 2014 Oct; 8(3): 215-23. doi: 10.1016/j.pcd.2014.01.001.

DOI: https://doi.org/10.54393/nrs.v4i02.83

[13] Alotaibi A, Gholizadeh L, Al-Ganmi A, Perry L. Examining perceived and actual diabetes knowledge among nurses working in a tertiary hospital. Applied Nursing Research. 2017 Jun; 35: 24-9. doi: 10.1016/j.apnr. =2017.02.014.

[14] Alharbi T, McLelland G, Thomacos N. Exploring diabetes educators' core competencies in the Kingdom of Saudi Arabia. Current Diabetes Reviews. 2021 Oct; 17(8): 69-79. doi: 10.2174/1573399817666210430125505.

[15] Tan JP, Cheng KK, Siah RC. A systematic review and metaanalysis on the effectiveness of education on medication adherence for patients with hypertension, hyperlipidaemia and diabetes. Journal of Advanced Nursing. 2019 Nov; 75(11): 2478-94. doi: 10.1111/jan.14025.

[16] AbuRuz M. Knowledge, Attitude and Practice of Nurses towards Evidence-Based Practice at Al-Medina, KSA. Jordan Medical Journal. 2017; 51(2).

[17] Albagawi B, Alkubati SA, Abdul-Ghani R. Levels and predictors of nurses' knowledge about diabetes care and management: disparity between perceived and actual knowledge. BioMed Central Nursing. 2023 Sep; 22(1): 342. doi: 10.1186/s12912-023-01504-5.

[18] Odili VU and Eke I. Knowledge of diabetes mellitus among registered nurses in Benin City. International Journal of Health Research. 2010; 3(3): 145-51. doi: 10.4314/ijhr.v3i3.70299.

[19] Giangola J, Olohan K, Longo J, Goldstein JM, Gross PA. Barriers to hyperglycemia control in hospitalized patients: a descriptive epidemiologic study. Endocrine Practice. 2008 Oct; 14(7): 813-9. doi: 10.4158/EP.14.7.813.

[20] Cheekati V, Osburne RC, Jameson KA, Cook CB. Perceptions of resident physicians about management of inpatient hyperglycemia in an urban hospital. Journal of Hospital Medicine: An Official Publication of the Society of Hospital Medicine. 2009 Jan; 4(1): E1-8. doi: 10.1002/jhm.383.

[21] Hjelm K, Mufunda E, Nambozi G, Kemp J. Preparing nurses to face the pandemic of diabetes mellitus: a literature review. Journal of Advanced Nursing. 2003 Mar; 41(5): 424-34. doi: 10.1046/j.1365-2648.2003.02548.x.

[22] Ahmed A, Jabbar A, Zuberi L, Islam M, Shamim K. Diabetes related knowledge among residents and nurses: a multicenter study in Karachi, Pakistan. BioMed Central Endocrine Disorders. 2012 Dec; 12: 1-8. doi: 10.1186/1472-6823-12-18.

[23] Renders CM, Valk GD, Griffin SJ, Wagner EH, Eijk van JT, Assendelft WJ. Interventions to improve the management of diabetes in primary care, outpatient, and community settings: a systematic review. Diabetes Care. 2001 Oct; 24(10): 1821-33. doi: 10.2337/diacare.24.10.1821.