

ORIGINAL ARTICLE

Assessment of Primary Health Care Physicians' Knowledge and Practices About Diabetes Mellitus in Aseer Region, Kingdom of Saudi Arabia

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ABSTRACT

Objective: To assess primary care physicians' knowledge and practice related to diabetes mellitus in Aseer Region, Kingdom of Saudi Arabia (KSA). **Subjects and Methods:** A total of 153 primary health care (PHC) physicians were included from Aseer Region. Each participant physician was interviewed using a study questionnaire that comprised personal characteristics data sheet and PHC physicians' assessment of knowledge (15 questions) and practices (10 questions). **Results:** Excellent knowledge and practice grades were attained by 32.7% and 23.5%, respectively, while unsatisfactory knowledge and practice grades were attained by 8.5% and 22.2% of PHC physicians. PHC physicians who had significantly more "excellent" knowledge grades were older ($p<0.001$), non-Saudi ($p<0.001$), higher qualified ($p=0.001$), with more postgraduate experience ($p<0.001$), with better grades of practice ($p<0.001$), and those who attended courses on diabetes ($p=0.006$). PHC physicians who had significantly more "excellent" practice grades were older ($p<0.001$), non-Saudi ($p=0.041$), having Doctorate/Fellowship ($p<0.001$), having more years of postgraduate experience ($p=0.001$), seeing more diabetic patients ($p<0.001$), and those who attended courses on diabetes ($p=0.008$). **Conclusions:** PHC physicians' knowledge and practice grades are suboptimal. Better knowledge and practice grades about diabetes are present among older, non-Saudi, higher qualified PHC physicians, with more postgraduate experience, better grades of practice, and those who attend courses on diabetes. Continuing medical education should be enforced for all PHC physicians, especially Saudi, younger, newly graduated PHC physicians.

Keywords: Diabetes mellitus, primary health care, knowledge, practice, Aseer Region

INTRODUCTION

Diabetes is a chronic disease that necessitates both continuous treatment and close cooperation between the physician and the patient.¹ It is a major public health problem worldwide. Globally, the number of

people with diabetes is expected to double between 2000 and 2030. It is estimated that the number of people with diabetes will reach 330 million by 2030 and more than 75% of the diabetics will be in developing countries.²

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The disease brings with it a considerable burden: people with diabetes have two- to four-fold increased risk of stroke and heart disease compared with the general population, along with an appreciable risk of retinopathy, peripheral nerve damage and renal problems.³ In the Kingdom of Saudi Arabia (KSA), Bahijri et al.⁴ reported that prevalence of diabetes was 18.3%. Prevalence of diabetes was shown to increase with age. For people aged ≥ 50 years, it was 46% for men and 44% for women.

Diabetes has detrimental effects on a range of health outcomes.^{5,6} noted that diabetes impairs all dimensions of health. In a more recent multinational study, diabetes was found to have a notable impact on general health⁷, the equivalent to that of having cardiovascular conditions, cancer and chronic respiratory disease.⁸

Because general practitioners working at different primary health care (PHC) facilities are in the first line of treatment in KSA, their knowledge, attitude and practice are the determining factor in controlling diabetes.⁹

In recent decades, care of patients with diabetes has shifted from specialist care to primary health care.¹⁰ The PHC physicians, who are the first line of defense in treating and guiding diabetics and their family members, are not fully equipped to provide initial and continuing care and counseling, because of the absence of the training at the undergraduate level and continuing medical education and training programs thereafter. It is therefore essential that knowledge and practice studies should be conducted in KSA as well.¹¹ This will represent a pivotal step towards implementation of targeted educational and training programs and ultimate improvement of care standards for patients with diabetes.¹²

Therefore, this study aimed to assess the PHC physicians' knowledge and practice related to diabetes mellitus in Aseer Region.

SUBJECTS AND METHODS

This cross-sectional study was conducted in Aseer Region during 2016. The study population comprised all PHC physicians in the study areas. A systematic random sample was performed to select 50% of the total PHC physicians to be included into the study. Each participant physician was interviewed by the

researcher using a structured questionnaire, that included:

- **Personal characteristics data sheet** (i.e., age, gender, nationality, highest qualification, years of experience after graduation, rural or urban workplace).
- **PHC physicians' assessment:** Based on thorough review of relevant literature, especially the standards and guidelines of the American Diabetes Association,¹³ the researcher constructed a questionnaire to assess knowledge and practice of PHC physicians as regard diabetes care. It comprised 25 questions (15 questions on knowledge and 10 questions on practice).

Correctly answered question or proper practices were assigned a score of (1), while incorrectly answered questions or improper practices were assigned a score of (0). The maximum possible attainable score was (15) for knowledge and (10) for practice. The total achieved scores by the PHC physician was graded as Excellent (>80%), Good (70-80%), Satisfactory (60-69%) or Poor (60%).

A pilot study was performed by the researcher on 25 PHC physicians. Their responses were not included in the main study. The pilot study aimed to test the study tool as regard clarity and wording. Accordingly, the final form of the data collection tool has been reached.

The list of names of all registered PHC physicians were obtained from their corresponding Directorates of Health. Each name was given a serial number. After excluding the names of 30 physicians who participated in the pilot study, a systematic random sample was followed to select 50% of the PHC physicians. After exclusion of the 25 PHC physicians who participated in the pilot study, a total of 153 physicians were included.

Before conducting the field work, the researcher fulfilled all the necessary official approvals from Aseer Directorates of Health. Before distributing the study questionnaire, PHC physicians were briefly informed about the objectives of this study and were invited to participate in the study, assuring them the full confidentiality and anonymity of any collected data. They were also informed that this study is not a "test" for their evaluation, and no harm is ever expected to occur as a result of their participation in this study.

The Statistical Package for Social Sciences (SPSS version 22.0) was used for data entry and analysis. The

descriptive statistics (i.e., frequency, percentage, mean and standard deviation) were calculated. Tests of significance were applied (e.g., χ^2 test). Statistically significant differences were considered at $p < 0.05$.

RESULTS

There were more physicians working in urban areas (57.5%) than rural areas (42.5%). More than one-third of physicians aged 30-40 years (42.5%), while 26.8% aged 41-50 years (27.4%) and 17.6% aged above 50 years.

The majority of physicians were males (81.7%) and non-Saudi (88.9%). Most PHC physicians had only a Bachelor degree (69.9%), while 17.6% had a Diploma or a Master degree and 12.4% had a Doctorate degree or a Fellowship. About two-fifths of PHC physicians had less than 10 years' experience after graduation (44.4%), while 24.2% had more than 20 years' experience after graduation. Almost half of PHC physicians examine (45.8%) examine about 30-70 diabetic patients weekly, while 32.7% examine more than 70 diabetic patients weekly. Almost two-thirds of PHC physicians did not attend courses on diabetes (62.1%). (Table 1)

As shown in Table 2, 33.3% of PHC physicians had good knowledge grade while 32.75 had excellent knowledge grade. Unsatisfactory knowledge grade was attained by only 8.5% of PHC physicians. Regarding PHC physicians' practice grades, 23.5% had excellent practice grade, while good practice grade was attained by 20.9% of PHC physicians. Unsatisfactory practice grade was attained by 22.2% of PHC physicians.

It is interesting to find that PHC physicians who had significantly more "excellent" knowledge grades were older ($p < 0.001$), non-Saudi ($p < 0.001$), higher qualified ($p = 0.001$), with more postgraduate experience ($p < 0.001$), with better grades of practice ($p < 0.001$), and those who attended courses on diabetes ($p = 0.006$). However, grades of knowledge of PHC physicians were not significantly different according to their gender, place of PHCC or number patients seen per week. (Table 3)

Table 1: Characteristics of study sample

Characteristics	No.	%
Age groups		
• <30 years	20	13.1
• 30-40 years	65	42.5
• 41-50 years	41	26.8
• >50 years	27	17.6
Gender		
• Male	125	81.7
• Female	28	18.3
Nationality		
• Saudi	17	11.1
• Non-Saudi	136	88.9
Highest qualifications		
• MBBS	107	69.9
• Diploma/Master	27	17.6
• Doctorate/Fellowship	19	12.4
Experience after graduation		
• <10 years	68	44.4
• 10-20 years	48	31.4
• >20 years	37	24.2
Place of PHCC		
• Urban	88	57.5
• Rural	65	42.5
Average number of diabetic patients seen per week		
• <30	33	21.6
• 30-70	70	45.8
• >70	50	32.7
Attending courses on diabetes		
• No	95	62.1
• Yes	58	37.9

Table 2: Overall physicians' knowledge and practice grades

Grades	No.	%
Knowledge grades		
• Unsatisfactory	13	8.5
• Satisfactory	39	25.5
• Good	51	33.3
• Excellent	50	32.7
Practice grades		
• Unsatisfactory	34	22.2
• Satisfactory	51	33.3
• Good	32	20.9
• Excellent	36	23.5

Table 3: Distribution of knowledge grades according to characteristics of physicians

Characteristics	Unsatisfactory		Satisfactory		Good		Excellent		P Value
	No.	%	No.	%	No.	%	No.	%	
Age groups									
• <30 years	6	30.0	3	15.0	7	35.0	4	20.0	<0.001
• 30-40 years	3	4.6	24	36.9	20	30.8	18	27.7	
• 41-50 years	4	9.8	11	26.8	13	31.7	13	31.7	
• >50 years	0	0.0	1	3.7	11	40.7	15	55.6	
Gender									
• Male	11	8.8	35	28.0	42	33.6	37	29.6	0.289
• Female	2	7.1	4	14.3	9	32.1	13	46.4	
Nationality									
• Saudi	6	35.3	3	17.6	5	29.4	3	17.6	<0.001
• Non-Saudi	7	5.1	36	26.5	46	33.8	47	34.6	
Highest qualifications									
• MBBS	10	9.3	36	33.6	32	29.9	29	27.1	0.001
• Diploma/Master	3	11.1	3	11.1	13	48.1	8	29.6	
• Doctorate/Fellowship	0	0.0	0	0.0	6	31.6	13	68.4	
Experience after graduation									
• <10 years	9	13.2	24	35.3	16	23.5	19	27.9	<0.001
• 10-20 years	4	8.3	14	29.2	19	39.6	11	22.9	
• >20 years	0	0.0	1	2.7	16	43.2	20	54.1	
Practice grades									
• Unsatisfactory	9	26.5	10	29.4	13	38.2	2	5.9	<0.001
• Satisfactory	4	7.8	11	21.6	26	51.0	10	19.6	
• Good	0	0.0	7	21.9	7	21.9	18	56.3	
• Excellent	0	0.0	11	30.6	5	13.9	20	55.6	
Place of PHCC									
• Urban	6	6.8	23	26.1	24	27.3	35	39.8	0.103
• Rural	7	10.8	16	24.6	27	41.5	15	23.1	
No. of diabetes seen/week									
• <30	2	6.1	8	24.2	17	51.5	6	18.2	0.080
• 30-70	8	11.4	20	28.6	15	21.4	27	38.6	
• >70	3	6.0	11	22.0	19	38.0	17	34.0	
Attending courses on diabetes									
• No	5	5.3	30	31.6	36	37.9	24	25.3	0.006
• Yes	8	13.8	9	15.5	15	25.9	26	44.8	

Table (4) shows that PHC physicians who had significantly more “excellent” practice grades were older ($p<0.001$), non-Saudi ($p=0.041$), having Doctorate/Fellowship ($p<0.001$), having more years of postgraduate experience ($p=0.001$), seeing more

diabetic patients ($p<0.001$), and those who attended courses on diabetes ($p=0.008$). However, PHC physicians’ practice grades did not differ significantly according to their gender or place of PHCC.

Table 4: Distribution of practice grades according to characteristics of physicians

Characteristics	Unsatisfactory		Satisfactory		Good		Excellent		P Value
	No.	%	No.	%	No.	%	No.	%	
Age groups									
• <30 years	7	35.0	10	50.0	2	10.0	1	5.0	<0.001
• 30-40 years	16	24.6	28	43.1	11	16.9	10	15.4	
• 41-50 years	10	24.4	8	19.5	13	31.7	10	24.4	
• >50 years	1	3.7	5	18.5	6	22.2	15	55.6	
Gender									
• Male	30	24.0	40	32.0	24	19.2	31	24.8	0.429
• Female	4	14.3	11	39.3	8	28.6	5	17.9	
Nationality									
• Saudi	6	35.3	9	52.9	1	5.9	1	5.9	0.041
• Non-Saudi	28	20.6	42	30.9	31	22.8	35	25.7	
Highest qualifications									
• MBBS	26	29.6	38	35.5	22	20.6	21	19.6	<0.001
• Diploma/Master	8	29.6	9	33.3	10	37.0	0	0.0	
• Doctorate/Fellowship	0	0.0	4	21.1	0	0.0	15	78.9	
Experience after graduation									
• <10 years	21	30.9	28	41.2	8	11.8	11	16.2	0.001
• 10-20 years	11	22.9	15	31.3	12	25.0	10	20.8	
• >20 years	2	5.4	8	21.6	12	32.4	15	40.5	
Place of PHCC									
• Urban	15	17.0	29	33.0	18	20.5	26	29.5	0.126
• Rural	19	29.2	22	33.8	14	21.5	10	15.4	
No. of diabetics seen/week									
• <30	6	18.2	16	48.5	11	33.3	0	0.0	<0.001
• 30-70	11	15.7	20	28.6	18	25.7	21	30.0	
• >70	17	34.0	15	30.0	3	6.0	15	30.0	
Attending courses on diabetes									
• No	18	18.9	41	43.2	19	20.0	17	17.9	0.008
• Yes	16	27.6	10	17.2	13	22.4	19	32.8	

DISCUSSION

Results of the current study revealed that most PHC physicians in Aseer Region were males and non-Saudi.

These personal characteristics are comparable to those described within the study of Khan et al.⁹ at PHC centers in Al-Hasa Region, Northern Province of KSA, where females constituted only one fourth of the PHC physicians and 76.8% of PHC physicians were non-Saudi.

The minimal involvement of female physicians in PHC settings may be explained by the conservative community in KSA in general and, especially in the southern regions of the Kingdom. In addition, the high proportion of non-Saudi PHC physicians reflects the

urgent need to graduate more physicians and to motivate them to work in the primary health care sector.

Results of the present study revealed that 8.5% of PHC physicians had unsatisfactory knowledge grade while 22.2% had unsatisfactory practice grade.

Low knowledge grades regarding diabetes were reported among physicians by Trepp et al.¹⁴ in Switzerland, who found an overall 43% of correctly answered questions by medical staff on the knowledge of inpatient diabetes care. In Iran, Peimani et al.¹⁵ reported that 71% of physicians had enough knowledge about diabetes, while the majority of physicians had unsatisfactory practice abilities.

Knowledge and practice grades of participant PHC physicians in the present study were significantly better among older and more experienced physicians than younger less experienced ones. Moreover, the correlation between age of participant PHC physicians as well as years of experience after graduation and scores for knowledge and practice were positive and statistically significant, i.e., as the age of PHC physicians becomes older and their experience becomes more, their knowledge and practice scores become higher.

These findings were not in agreement with those of Khan et al.,⁹ who reported that KAP score of general practitioners in Al-Hasa District decreased with increasing years of experience after graduation. The KAP of general practitioners with 1-5 years of experience was significantly higher than that in those with more experience. They explained their finding by the fact that the young general practitioners are more familiar with new approaches of diagnosis and treatment of diabetes, which may be lacking among the senior general practitioners.

In Pakistan, Shera et al.¹¹ stated that family physicians with practice duration of 6-10 years had significantly better knowledge. They explained their finding by the fact that in Pakistan, there is no system of re-certification of practicing physicians. Therefore, senior doctors with established practices may not necessarily be conversant with recent approaches regarding diagnosis and treatment of diabetes.

In Iran, Peimani et al.¹⁵ reported that knowledge of 29% of physicians was sufficient regarding diabetes. Onyiriuka et al.¹⁶ reported that Nigerian physicians had knowledge gaps and suboptimal practices regarding diabetes mellitus. They suggested that most physicians require additional education, focusing on diabetes mellitus to provide an acceptable level of care to diabetic patients, especially children and adolescents

This study showed that knowledge and practice grades of PHC physicians did not differ according to their gender or place of their PHCC.

These findings are not in agreement with those of Shera et al.,¹¹ who noted that family physicians in the rural areas had better level of knowledge on diabetes. Similarly, in Al-Hasa District, KSA, Khan et al.⁹ reported that the overall knowledge and practice scores of the rural physicians were significantly higher

than those attained by urban physicians. Moreover, they reported that knowledge and practice scores for female general practitioners was significantly lower than those of the male general practitioners.

The lack of significant differences in participants' knowledge and practice grades according to gender or place of their PHCC indicates that the need to improve PHC physicians' knowledge and practice should cover all PHC physicians in all areas of Aseer Region.

The study showed that grades of knowledge and practice of PHC physicians were significantly better among non-Saudi PHC physicians than Saudi PHC physicians. Similarly, Khan et al.,⁹ in Al-Hasa District, revealed that the KAP scores for Saudi physicians were significantly lower compared with non-Saudi physicians.

Findings of the present study showed that grades of knowledge and practice of PHC physicians were significantly better among highly qualified physicians than less qualified physicians.

These findings are in agreement with those of Gosmanova and Gosmanova¹⁷ showed that generally, physicians' knowledge regarding treatment of diabetes was not enough, and knowledge levels differed significantly according to physician's qualification.

However, Peimani et al.¹⁵ reported that knowledge and practice scores of physicians about diabetes were less with more qualification and specialization. They explained their findings by the limited number of patients referred to specialists, based on their specialty. They emphasized that specialists should update their knowledge about other diseases, beside their specialties, such as diabetes.

The current study showed that PHC physicians who see more diabetic patients weekly had significant better knowledge and practice grades than those who see less number of patients. This finding is not in agreement with that reported by Rätsep et al.,¹⁸ who reported no difference in family physicians' knowledge and practice according to the number of patients with diabetes in the doctors' list.

Significantly better knowledge and practice grades attained by PHC physicians in the present study may be explained by that PHC physicians who see more diabetic patients acquire more experience than those who see less diabetic patients. Moreover, this study revealed that most PHC physicians did not attend any

educational course or educational program on diabetes. PHC physicians who attended educational courses or training workshops on diabetes had significantly better knowledge and practice grades than those who did not.

However, Junod¹⁹ stated that investments for improvements in medical education suffer from obstacles of this kind. A systemically organized inpatient diabetes service headed by a diabetologist providing regular training and support for residents has been recommended by professional societies and experts, but is frequently lacking.²⁰ Trepp et al.¹⁴ noted that in hospitals without a diabetologist, training and support depends on the qualifications of the remaining attending physicians. Considering the inadequate performance of attending physicians not specifically trained in diabetes management, hospitals without a diabetologist may need to focus primarily on re-education of their attending staff.

On the other hand, Akl et al.²¹ and Jabbar et al.²² reported that continuing education courses are important to correct physicians' attitude. All educational programs that do both, updating physicians' knowledge and correcting their attitude, are more effective than the traditional methods that only emphasize on physicians to follow the standards of care.

This study showed significant associations between knowledge grades and practice grades, suggesting that PHC physicians with lower knowledge grades tend to have also lower practice grades, while PHC physicians with higher knowledge grades tend to have higher practice grades. Moreover, the study showed significantly positive correlation coefficients between PHC physicians' knowledge, attitude and practice scores as there is a documented inter-linked relation between physicians' knowledge and practice regarding diabetes care.²³

In conclusion, PHC physicians' knowledge and practice grades are suboptimal. Better knowledge and practice grades about diabetes are present among older, non-Saudi, higher qualified PHC physicians, with more postgraduate experience, better grades of practice, and those who attend courses on diabetes. Therefore, continuing medical education and training should be enforced for all PHC physicians, especially Saudi, younger, newly graduated PHC physicians.

REFERENCES

1. Bajkowska-Fiedziukiewicz A, Cypryk K, Kozdraj T, Mikołajczyk-Swatko A, Kosiński M, Józefowska M. Self-monitoring of blood glucose and treatment outcomes in type 2 diabetic patients. *Polskie Archiwum Medycyny Wewnętrznej* 2008; 118 (5):267-272.
2. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. *Diabetes Care* 2004; 27(5):1047-1053.
3. Eljedia A, Mikołajczyk RT, Kraemer A, Laaser U. Health-related quality of life in diabetic patients and controls without diabetes in refugee camps in the Gaza strip: a cross-sectional study. *BMC Public Health* 2006, 6:268.
4. Bahijri SM, Jambi HA, Al Raddadi RM, Ferns G, Tuomilehto J. The Prevalence of Diabetes and Prediabetes in the Adult Population of Jeddah, Saudi Arabia- A Community-Based Survey. *PLOS one* 2016. Website: <https://doi.org/10.1371/journal.pone.0152559>
5. Reddy SS: Health outcomes in type 2 diabetes. *Int J Clin Pract. Suppl* 2000, 113:46-53.
6. Stewart AL, Greenfield S, Hays RD, Wells K, Rogers WH, Berry SD, McGlynn EA, Ware JE Jr: Functional status and well-being of patients with chronic conditions. Results from the Medical Outcomes Study. *JAMA* 1989; 262(7):907-913.
7. Alonso J, Ferrer M, Gandek B, Ware JE Jr, Aaronson NK, Mosconi P, Rasmussen NK, Bullinger M, Fukuhara S, Kaasa S, Lepke A, IQOLA Project Group: Health-related quality of life associated with chronic conditions in eight countries: results from the International Quality of Life Assessment (IQOLA) Project. *Qual Life Res* 2004, 13:283-298.
8. Sprangers MA, de Regt EB, Andries F, van Agt HM, Bijl RV, de Boer JB, Foets M, Hoeymans N, Jacobs AE, Kempen GI, Miedema HS, Tjihuis MA, de Haes HC: Which chronic conditions are associated with better or poorer quality of life? *J ClinEpidemiol* 2000, 53:895-907.
9. Khan AR, Al Abdul Lateef ZN, Khamseen MB, Al Aithan MA, Khan SA, Al Ibrahim I. Knowledge, attitude and practice of Ministry of Health primary health care physicians in the management of type 2 diabetes mellitus: A cross-sectional study in the Al-Hasa District of Saudi Arabia, 2010. *Nigerian Journal of Clinical Practice* 2011; 14(1):52-59.
10. Khunti K, Ganguli S: Who looks after people with diabetes: primary or secondary care? *J R Soc Med* 2000, 93:183-186.
11. Shera AS, Jawad F, Basit A. Diabetes related knowledge, attitude and practices of family physicians in Pakistan. *J Pak Med Assoc* 2002; 52(10):465-470.
12. Clement S. Better glycemic control in the hospital: beneficial and feasible. *Cleve Clin J Med.* 2007;74(2):111-120.

13. American Diabetes Association. Standards of Medical Care in Diabetes—2013. *Diabetes Care* 2013; 36 (Suppl 1):S11-66.
14. Trepp R, Wille T, Wieland T, Reinhart WH. Diabetes-related knowledge among medical and nursing house staff. *Swiss Med Wkly.* 2010; 140(25-26):370-375.
15. Peimani M, Tabatabaei-Malazy O, Heshmat R, Moghaddam SA, Sanjari M, Pajouhi M. Knowledge, Attitude and Practice of physicians in the field of diabetes and its complications; A pilot study. *Iranian Journal of Diabetes and Lipid Disorders*; 2010; 9:1- 7.
16. Onyiriuka AN, Oluwayemi IO, Achonwa CJ, Abdullahi M, Oduwole AO, Oyenusi EE, Fakeye-Udeogu OB. Nigerian physicians' knowledge, attitude and practices regarding diabetes mellitus in the paediatric age group. *Journal of Community Medicine and Primary Health Care* 2016; 28(1) 52-58
17. Gosmanova A, Gosmanova N. Assessing diabetes-related knowledge among internal medicine residents using multiple-choice questionnaire. *Am J Med Sci* 2009; 338 (5):348-452.
18. Rätsep A, Kalda R, Oja I, Lember M. Family doctors' knowledge and self-reported care of type 2 diabetes patients in comparison to the clinical practice guideline: cross-sectional study. *BMC Fam Pract.* 2006; 7:36.
19. Junod AF. Will there be room for the teaching of internal medicine in a university hospital? *Swiss Med Wkly.* 2002; 132(1-2):4-6.
20. Lubitz CC, Seley JJ, Rivera C, Sinha N, Brillon DJ. The perils of inpatient hyperglycemia management: how we turned apathy into action. *Diabetes Spectr.* 2007; 20(1):18-21.
21. Akl OA, Khairy AE, Abdel-Aal NM, Deghedi BS, Amer ZF. Knowledge, Attitude, Practice and Performance of Family Physicians Concerning Holistic Management of Hypertension. *J Egypt Public Health Assoc* 2006; 81(5&6): 337-353.
22. Jabbar A, Hameed A, Chawla R, Akhter J. How well do Pakistani patients and physicians adhere to standards of diabetes care? *Int J Diab Dev Ctries* 2007; 27: 93-96.
23. O'Brien SV, Michaels SE, Hardy KJ. A comparison of general nurses' and junior doctors' diabetes knowledge. *Prof Nurse.* 2003; 18: 257-260.