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Clinical evaluation of the knowledge, attitude and practice in cases suffered from diabetes mellitus in Bihar region

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Abstract
In a developing country like India where majority of the people belong to the lower socioeconomic status and low level of education makes it vulnerable to lifestyle diseases like diabetes and hypertension. Compared with the general population incidence of Coronary heart diseases and stroke are more among patients of diabetes. Their quality of life is further impacted by complications like diabetic renal disease and diabetic retinopathy and neuropathy which are frequently occurring among the patients having poor glycemic control. Hence the present study was planned for Clinical Evaluation of the Knowledge, Attitude and Practice in Cases Suffered from Diabetes Mellitus in Bihar region.
The present study was planned in Department of General Medicine, Patna Medical College and Hospital, Patna, Bihar, India. Total 100 cases of the diabetes referred to our hospital were included in the present study. All the cases were interviewed and made to fill a pretested, predesigned questionnaire. The questionnaire consisted of three parts. In the first part there was information regarding the demographic detail of the subject like age, gender, education level etc. The 2nd part they were tested about the knowledge of diabetes and in the third part attitude of the individuals were tested. All the questions had three options- yes, no, don't know.
The data generated from the present study concludes that there is reasonable gap between knowledge, attitudes and practices, so to overcome that it is very important to formulate and implement certain strategies by which positive attitudes can be converted into beneficial practices. Diabetes is associated with high morbidity and mortality. Here, the onus is on the patients to control their disease, and merely knowing about the diagnosis is not enough. Hence, proper health education and individual counseling should be practiced in various healthcare setups to ensure that each patient with diabetes has sufficient information and that they are motivated to lead a better life.

Keywords: diabetes mellitus, knowledge, attitude and practice, Bihar, etc

Introduction
Type 2 diabetes mellitus consists of an array of dysfunctions characterized by hyperglycemia and resulting from the combination of resistance to insulin action, inadequate insulin secretion, and excessive or inappropriate glucagon secretion. Poorly controlled type 2 diabetes is associated with an array of microvascular and macrovascular complications.
Microvascular complications of diabetes include retinal, renal, and neuropathic disease. Macrovascular complications include coronary artery, cerebrovascular and peripheral vascular disease. Diabetic neuropathy affects autonomic and peripheral nerves. Unlike patients with type 1 diabetes mellitus, patients with type 2 are not absolutely dependent on insulin for life. This distinction was the basis for the older terms for types 1 and 2, insulin dependent and non–insulin dependent diabetes respectively.
However, many patients with type 2 diabetes are ultimately treated with insulin. Because they retain the ability to secrete some endogenous insulin, they are considered to require insulin but not to depend on insulin. Nevertheless, given the potential for confusion due to classification based on treatment rather than etiology, the older terms have been abandoned [1]. Another older term for type 2 diabetes mellitus was adult-onset diabetes. Currently, because of the epidemic of obesity and inactivity in children, type 2 diabetes mellitus is occurring at younger ages. Although type 2 diabetes mellitus typically affects individuals older than 40 years, it has been diagnosed in children as young as 2 years of age who have a family history of diabetes. In many communities, type 2 diabetes now outnumbers type 1 among children with newly diagnosed diabetes.
Diabetes mellitus is a chronic disease that requires long-term medical attention to limit the development of its devastating complications and to manage them when they do occur. It is a disproportionately expensive disease; in the United States in 2012, the direct and indirect costs of diagnosed diabetes were estimated to be $245 billion; people with diagnosed diabetes had average medical expenditures 2.3 times those of people without diabetes [2, 3].
This article focuses on the diagnosis and treatment of type 2 diabetes and its acute and chronic complications, other than those directly associated with hypoglycemia and severe metabolic disturbances, such as hyperosmolar hyperglycemic state (HHS) and diabetic ketoacidosis (DKA).
Type 2 diabetes is characterized by a combination of peripheral insulin resistance and inadequate insulin secretion by pancreatic beta cells. Insulin resistance, which has been attributed to elevated levels of free fatty acids and

proinflammatory cytokines in plasma, leads to decreased glucose transport into muscle cells, elevated hepatic glucose production, and increased breakdown of fat.

A role for excess glucagon cannot be underestimated; indeed, type 2 diabetes is an islet paracrinopathy in which the reciprocal relationship between the glucagon-secreting alpha cell and the insulin-secreting beta cell is lost, leading to hyperglucagonemia and hence the consequent hyperglycemia [4].

For type 2 diabetes mellitus to occur, both insulin resistance and inadequate insulin secretion must exist. For example, all overweight individuals have insulin resistance, but diabetes develops only in those who cannot increase insulin secretion sufficiently to compensate for their insulin resistance. Their insulin concentrations may be high, yet inappropriately low for the level of glycemia.

With prolonged diabetes, atrophy of the pancreas may occur. A study by Philippe *et al* used computed tomography (CT) scan findings, glucagon stimulation test results, and fecal elastase-1 measurements to confirm reduced pancreatic volume in individuals with a median 15-year history of diabetes mellitus (range, 5-26 years) [5]. This may also explain the associated exocrine deficiency seen in prolonged diabetes.

Beta-cell dysfunction is a major factor across the spectrum of prediabetes to diabetes. A study of obese adolescents by Bacha *et al* confirms what is increasingly being stressed in adults as well: Beta-cell dysfunction develops early in the pathologic process and does not necessarily follow the stage of insulin resistance. [6]. In the progression from normal to abnormal glucose tolerance, postprandial blood glucose levels increase first. Eventually, fasting hyperglycemia develops as suppression of hepatic gluconeogenesis fails. During the induction of insulin resistance (such as occurs with a high-calorie diet, steroid administration, or physical inactivity), increased glucagon levels and increased glucose-dependent insulinotropic polypeptide (GIP) levels accompany glucose intolerance. However, the postprandial glucagonlike peptide-1 (GLP-1) response is unaltered [7].

Genome-wide association studies of single-nucleotide polymorphisms (SNPs) have identified a number of genetic variants that are associated with beta-cell function and insulin resistance. Some of these SNPs appear to increase the risk for type 2 diabetes. Over 40 independent loci demonstrating an association with an increased risk for type 2 diabetes have been shown [8].

Although the pathophysiology of the disease differs between the types of diabetes, most of the complications, including microvascular and macrovascular are similar regardless of the type of diabetes. Hyperglycemia appears to be the determinant of microvascular and metabolic complications. Macrovascular disease may be less related to glycemia. Telomere attrition may be a marker associated with presence and the number of diabetic complications. Whether it is a cause or a consequence of diabetes remains to be seen [9].

Cardiovascular risk in people with diabetes is related in part to insulin resistance, with the following concomitant lipid abnormalities: Elevated levels of small, dense low-density lipoprotein (LDL) cholesterol particles; Low levels of high-density lipoprotein (HDL) cholesterol; Elevated levels of triglyceride-rich remnant lipoproteins. Thrombotic abnormalities (ie, elevated type-1 plasminogen activator inhibitor [PAI-1], elevated fibrinogen) and hypertension are also involved. Other conventional atherosclerotic risk factors (eg, family history, smoking, elevated LDL cholesterol) also affect cardiovascular risk.

Insulin resistance is associated with increased lipid accumulation in liver and smooth muscle, but not with increased myocardial lipid accumulation [10]. Persistent lipid abnormalities remain in patients with diabetes despite the use of lipid-modifying drugs, although evidence supports the benefits of these drugs. Statin dose up-titration and the addition of other lipid-modifying agents are needed [11].

Increased cardiovascular risk appears to begin prior to the development of frank hyperglycemia, presumably because of the effects of insulin resistance. Stern in 1996 [12] and Haffner and D'Agostino in 1999 [13] developed the "ticking clock" hypothesis of complications, asserting that the clock starts ticking for microvascular risk at the onset of hyperglycemia, while the clock starts ticking for macrovascular risk at some antecedent point, presumably with the onset of insulin resistance.

The question of when diabetes becomes a cardiovascular risk equivalent has not yet been settled. Debate has moved beyond automatically considering diabetes a cardiovascular risk equivalent. Perhaps it would be prudent to assume the equivalency with diabetes that is more than 5-10 years in duration.

In a cross-sectional study of 350 patients aged 55 years and older with type 2 diabetes and 363 control participants aged 60 years and older without diabetes, diabetic individuals were more likely to have brain atrophy than cerebrovascular lesions, with patterns resembling those of preclinical Alzheimer disease. Type 2 diabetes was associated with hippocampal atrophy; temporal, frontal, and limbic gray-matter atrophy; and, to a lesser extent, frontal and temporal white-matter atrophy.

Type 2 diabetes was also linked with poorer performance on certain cognitive tests. The strength of these associations dropped by almost 50% when adjusted for hippocampal and total gray-matter volumes but was unchanged when adjusted for cerebrovascular lesions or white-matter volume. Patients with type 2 diabetes were more likely to have gray-matter atrophy in several bilateral regions of the cortices, especially in the left hemisphere, similar to the distribution of cortical atrophy described in early Alzheimer disease [14, 15].

The etiology of type 2 diabetes mellitus appears to involve complex interactions between environmental and genetic factors. Presumably, the disease develops when a diabetogenic lifestyle (ie, excessive caloric intake, inadequate caloric expenditure, obesity) is superimposed on a susceptible genotype. The body mass index (BMI) at which excess weight increases risk for diabetes varies with different racial groups. For example, compared with persons of European ancestry, persons of Asian ancestry are at increased risk for diabetes at lower levels of overweight. Hypertension and prehypertension are associated with a greater risk of developing diabetes in whites than in African Americans.

In addition, an in utero environment resulting in low birth weight may predispose some individuals to develop type 2 diabetes mellitus. Infant weight velocity has a small, indirect effect on adult insulin resistance, and this is primarily mediated through its effect on BMI and waist circumference [16].

About 90% of patients who develop type 2 diabetes mellitus are obese. However, a large, population-based, prospective

study has shown that an energy-dense diet may be a risk factor for the development of diabetes that is independent of baseline obesity [17].

Some studies suggest that environmental pollutants may play a role in the development and progression of type 2 diabetes mellitus. [18] A structured and planned platform is needed to fully explore the diabetes-inducing potential of environmental pollutants. Secondary diabetes may occur in patients taking glucocorticoids or when patients have conditions that antagonize the actions of insulin (eg, Cushing syndrome, acromegaly, pheochromocytoma).

Type 2 diabetes mellitus is less common in non-Western countries where the diet contains fewer calories and daily caloric expenditure is higher. However, as people in these countries adopt Western lifestyles, weight gain and type 2 diabetes mellitus are becoming virtually epidemic. Rates of diabetes are increasing worldwide. The International Diabetes Federation predicts that the number of people living with diabetes will to rise from 366 million in 2011 to 552 million by 2030. [19] In the United States, the prevalence of diagnosed diabetes has more than doubled in the last 3 decades, largely because of the increase in obesity.

The top 10 countries in number of people with diabetes are currently India, China, the United States, Indonesia, Japan, Pakistan, Russia, Brazil, Italy, and Bangladesh. The greatest percentage increase in rates of diabetes will occur in Africa over the next 20 years. Unfortunately, at least 80% of people in Africa with diabetes are undiagnosed, and many in their 30s to 60s will die from diabetes there.

Type 2 diabetes mellitus occurs most commonly in adults aged 40 years or older, and the prevalence of the disease increases with advancing age. Indeed, the aging of the population is one reason that type 2 diabetes mellitus is becoming increasingly common. Virtually all cases of diabetes mellitus in older individuals are type 2.

In addition, however, the incidence of type 2 diabetes is increasing more rapidly in adolescents and young adults than in other age groups. The disease is being recognized increasingly in younger persons, particularly in highly susceptible racial and ethnic groups and the obese. In some areas, more type 2 than type 1 diabetes mellitus is being diagnosed in prepubertal children, teenagers, and young adults.

In a developing country like India where majority of the people belong to the lower socioeconomic status and low level of education makes it still vulnerable to lifestyle diseases like diabetes and hypertension. Compared with the general population incidence of Coronary heart diseases and stroke are more among patients of diabetes. Their quality of life is further impacted by complications like diabetic renal disease and diabetic retinopathy and neuropathy which are frequently occurring among the patients having poor glycemic control [20]. Hence based on above findings the present study was planned for clinical evaluation of Clinical Evaluation of the Knowledge, Attitude and Practice in Cases Suffered from Diabetes Mellitus in Bihar region.

Methodology

The present study was planned in Department of General Medicine, Patna Medical College and Hospital, Patna, Bihar, India. Total 100 cases of the diabetes referred to our hospital were included in the present study. All the cases were interviewed and made to fill a pretested, predesigned questionnaire. The questionnaire consisted of three parts. In the first part there was information regarding the demographic detail of the subject like age, gender, education level etc. The 2nd part they were tested about the knowledge of diabetes and in the third part attitude of the individuals were tested. All the questions had three options- yes, no, don't know.

All the patients were informed consents. The aim and the objective of the present study were conveyed to them. Approval of the institutional ethical committee was taken prior to conduct of this study.

Following was the inclusion and exclusion criteria for the present study.

Inclusion Criteria: Patients aged above or equal to 20 years, of either sex. Patients suffering from type 2 diabetes mellitus, with or without co-morbidities. Patients willing to provide voluntary written informed consent.

Exclusion Criteria: Patients aged below 20 years. Patients suffering from type 1 diabetes mellitus or gestational diabetes. Patients not willing to provide voluntary written informed consent.

Results & Discussion

Diabetes mellitus is a major public health problem affecting more than 171 million people worldwide and the number is expected to rise to 366 million by 2030 [21]. Type 2 Diabetes will continue to account for 90% of all the cases. The total number of diabetics in India was 41 million in 2006 and that this would rise to 70 million by the year 2025 [22]. Increased prevalence in India is attributed to the life style changes coupled with urbanization and rapid industrialization. Poor awareness and practices among diabetic patients are some of the important variables influencing the progression of diabetes and its complications, which are largely preventable [23].

Diabetes is associated long term complications like diabetic retinopathy, nephropathy and neuropathy which can be better prevented by frequent examination of the relevant system to detect the development of complication at an early stage and to prevent the progress the disease.

As far as knowledge regarding the complications of diabetes is concerned; in the current study only few patients knew about the complications and how to avoid them. The awareness about diabetes complications in the present study is lower than that reported by many studies [24].

Diabetes mellitus has become a cause of growing public health concern in developing countries, as it has been for a long time in the most developed ones [25, 26]. Diabetes can lead to increased morbidity and mortality [27]. The prevalence of Type 2 is projected to increase, making type 2 DM a pandemic [28]. Pakistan highlighted the fact that a proper education and awareness program can change the attitude of the public regarding diabetes, as a large gap between knowledge and attitude among the diabetes patients was found [29]. The reasons for the increase in the prevalence of diabetes mellitus in developing countries may include unhealthy lifestyle, rapid westernization, poor knowledge, negative attitude and poor practices towards DM among the general population. There exists a large gap between the knowledge, attitude and practice towards diabetes among diabetic patients. Knowledge about diabetes mellitus, appropriate attitude and practices are vital to reduce the prevalence and morbidity associated with DM. However, very few studies have focused on this area and there is a lack of the knowledge, attitude and practices data among

Indian diabetic patients. There is improper guidance about the disease due to lack of understanding of patients characteristics i.e. personality and attitude of the patient. Obtaining information about the level of awareness about diabetes in a population is the first step in formulating a prevention program for diabetes [30]. A study from and proper knowledge regarding various aspects of health education program can improve the knowledge of patients and change their attitude.8 Knowledge about Diabetes Mellitus, appropriate attitude and practices are vital to reduce the prevalence and morbidity associated with DM [31, 33].

Table 1: Demographic Details

Variable	No. of Cases
Gender	
Male	45
Females	55
Age	
20 – 30 years	17
31 – 40 years	32
41 – 50 years	21
50 years & above	30
Marital status	
Single	11
Married	74
Divorced	15
Education	
Illiterate	31
Graduate	53
Post graduate	16
Socioeconomic status	
Upper class	23
Middle class	59
Lower class	18

Table 2: Knowledge & Attitude

Variable	No. of Cases		
	Yes	No	I Don't know
Have you heard about diabetes?	31	39	30
What are the risk factors for diabetes?			
Age	22	44	34
Genetic	10	38	52
Overweight/obesity	23	13	64
Pregnancy	11	16	73
Diet	13	47	40
No exercise	35	25	40
What are the signs and symptoms			
Increased urination	33	43	24
Increased thirst	25	41	34
Weight loss	35	40	25
High blood sugar	41	25	34
Increased hunger	18	34	48
Weakness	30	22	48
Management			
Insulin injections	33	36	31
Medicines	11	40	49
Exercise	15	30	55
Diet regulation	13	33	54
Eye checkup	22	40	38
Feet and toes checkup	10	45	45
Complications			
Blindness	24	56	20
Kidney failure	11	40	49
Heart failure	12	44	44
Amputation of limb	8	22	70
Attitude			
I don't mind if others know that I am with DM	40	35	25
Do you think family members should be screened for DM	45	23	32
Do you think that you should be examined for DM	49	31	20
Do you think physical activity can prevent risk of DM	15	50	35
Do you think maintaining a healthy weight is important in management	16	44	40

A systematic review concluded that diabetes patients might perceive better self-efficacy in disease management with self-monitoring of blood glucose, and would have a better understanding about the possible factors that affect diabetes management [34]. Moreover, self-monitoring of blood glucose might also improve medication adherence and motivate patients to make necessary lifestyle changes. It is well understood that diabetes management requires patient involvement for a better disease control [35, 36]. Improving knowledge level of the patients regarding the drugs can be done by many ways including group education as well as through patient counselling. Patient counselling by the pharmacist can play a vital role in imparting education to the diabetes patients [37].

In present study, the responses to the practice questions regarding the diabetes indicates that the study participants were unaware of the importance of regular health check-ups which may lead to complications and furthermore economic burden to the patients. In case of diabetes definite cure cannot be provided by medicines alone. Thus decreased symptoms and slowing down the progression of the disease and improvement in the function becomes important in the management of the disease. It is well understood that hypertension and diabetes management requires patient involvement for a better disease control. Improving KAP (knowledge, attitude and practice) of the patients regarding the disease and drugs can improve the medication adherence behavior, which in turn improves the therapeutic outcomes and it can be done by many ways including group education as well as through patient counseling. Thus, the pharmacist has a potential role as patient educator in the management of diabetes and hypertension.

Conclusion

The data generated from the present study concludes that there is reasonable gap between knowledge, attitudes and practices, so to overcome that it is very important to formulate and implement certain strategies by which positive attitudes can be converted into beneficial practices. Diabetes is associated with high morbidity and mortality. Here, the onus is on the patients to control their disease, and merely knowing about the diagnosis is not enough. Hence, proper health education and individual counselling should be practiced in various healthcare setups to ensure that each patient with diabetes has sufficient information and that they are motivated to lead a better life.

References

1. Report of the expert committee on the diagnosis and classification of diabetes mellitus. Diabetes Care. 2003; 26(1):S5-20.
2. Centers for Disease Control and Prevention. National Diabetes Statistics Report, 2017. Available at https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf.
3. Harrison P. Almost Half the US Population Has Diabetes or Its Precursor. Medscape Medical News, 2017.
4. Unger RH, Orci L. Paracrinology of islets and the paracrinopathy of diabetes. Proc Natl Acad Sci U S A. 2010; 107(37):16009-12.
5. Philippe MF, Benabadji S, Barbot-Trystram L, Vadrot D, Boitard C, Larger E. *et al*. Pancreatic volume and endocrine and exocrine functions in patients with diabetes. Pancreas. 2011 Apr. 40(3):359-63.
6. Bacha F, Lee S, Gungor N, Arslanian SA. From pre-diabetes to type 2 diabetes in obese youth: pathophysiological characteristics along the spectrum of glucose dysregulation. Diabetes Care. 2010; 33(10):2225-31.
7. Hansen KB, Vilsboll T, Bagger JI, Holst JJ, Knop FK. Increased postprandial GIP and glucagon responses, but unaltered GLP-1 response after intervention with steroid hormone, relative physical inactivity, and high-calorie diet in healthy subjects. J Clin Endocrinol Metab. 2011; 96(2):447-53.
8. Wheeler E, Barroso I. Genome-wide association studies and type 2 diabetes. Brief Funct Genomics. 2011 Mar. 10(2):52-60.
9. Testa R, Olivieri F, Sirolla C, Spazzafumo L, Rippo MR, Marra M, *et al*. Leukocyte telomere length is associated with complications of type 2 diabetes mellitus. Diabet Med. 2011; 28(11):1388-94. [Medline].
10. Krssak M, Winhofer Y, Gobl C, Bischof M, Reiter G, Kautzky-Willer A. *et al*. Insulin resistance is not associated with myocardial steatosis in women. Diabetologia. 2011; 54(7):1871-8. [Medline].
11. Leiter LA, Lundman P, da Silva PM, Drexel H, Junger C, Gitt AK. Persistent lipid abnormalities in statin-treated patients with diabetes mellitus in Europe and Canada: results of the Dyslipidaemia International Study. Diabet Med. 2011; 28(11):1343-51. [Medline].
12. Stern MP. Do non-insulin-dependent diabetes mellitus and cardiovascular disease share common antecedents?. Ann Intern Med. 1996; 124(1 Pt 2):110-6. [Medline].
13. Haffner SM, D'Agostino R Jr, Mykkanen L, Tracy R, Howard B, Rewers M. *et al*. Insulin sensitivity in subjects with type 2 diabetes. Relationship to cardiovascular risk factors: the Insulin Resistance Atherosclerosis Study. Diabetes Care. 1999; 22(4):562-8. [Medline].
14. Busko M. Gray-matter atrophy may drive cognitive decline in diabetes. Medscape Medical News. August 22, 2013. [Full Text].
15. Moran C, Phan TG, Chen J. *et al*. Brain atrophy in type 2 diabetes: regional distribution and influence on cognition. Diabetes Care, 2013.
16. Slining MM, Kuzawa CW, Mayer-Davis EJ, Adair LS. Evaluating the indirect effect of infant weight velocity on insulin resistance in young adulthood: a birth cohort study from the Philippines. Am J Epidemiol. 2011; 173(6):640-8. [Medline]. [Full Text].
17. Wang J, Luben R, Khaw KT, Bingham S, Wareham NJ, Forouhi NG. *et al*. Dietary energy density predicts the risk of incident type 2 diabetes: the European Prospective Investigation of Cancer (EPIC)-Norfolk Study. Diabetes Care. 2008; 31(11):2120-5. [Medline]. [Full Text].
18. Hectors TL, Vanparys C, van der Ven K, Martens GA, Jorens PG, Van Gaal LF. *et al*. Environmental pollutants and type 2 diabetes: a review of mechanisms that can disrupt beta cell function. Diabetologia. 2011; 54(6):1273-90.
19. One adult in ten will have diabetes by 2030. International Diabetes Federation. November 14, 2011. Available at http://www.idf.org/media-events/press-releases/2011/diabetes-atlas-5th-edition.

20. Park K. Park's Textbook of Preventive and Social Medicine, 21st ed. Jabalpur: Bhanot Publishers, 2011, P341-45.
21. 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; 27:1047-53.
22. Sarah W, Bachir MB, Gojka R, Anders G, Richard S, Hilary K. *et al*. World Health Organisation Report on Global Prevalence of Diabetes- Estimates for the year 2000 and projections for 2030, Diabetes Care. 2004; 27(5):21-26.
23. Ramachandran A, Snehalatha C, Baskar AD, Mary S, Kumar CK, Selvam S. *et al*. Temporal changes in prevalence of diabetes and impaired glucose tolerance associated with lifestyle transition occurring in the rural population in India. Diabetologia, 2004; 47:860-5.
24. Basavanagowdappa H, Prabhakar AK, Prasannaraj P, Gurudev KC, Virupaksha Suma. Study of prevalence of diabetes mellitus and impaired fasting glucose in a rural population. International Journal of Diabetes in Developing Countries, 2005; 25:98-101.
25. Braunwald E, Isselbacher KJ, Wilson JD. Harrison's Principle of Internal medicine, Mcgraw-Hill, 14th Edition, 1998; 2:2060-2080
26. Hall V, Thomsen RW, Henriksen O, Lohse N. Diabetes in Sub-Sahara Africa 1999-2011: Epidemology and public health implication, a systematic review, BMC public health. 2011; 11(564):1-12.
27. Adibah H, Idris MN Osman Ali. Perception and behaviour of diabetic patients on blood glucose maintenance. Int. J Diab. Dev. Countries, 1998; 18:71-74.
28. Al Shafaee MA, Al-Shukaili S, Rizvi SG, Al Farsi Y, Khan MA, Ganguly SS. *et al*. Knowledge and perceptions of diabetes in a semi-urban Omani population. BMC Public Health, 2008; 8:249-251.
29. Badrudin N, Basit A, Hydrie MZI, Hakeem R. Knowledge, Attitude and Practices of patient visiting a diabetes care unit. Pak J Nutrition, 2002; 1:99-102.
30. Mohan D, Raj D, Shanthiram CS. *et al*. Awareness and Knowledge of diabetes in Chennai-The Chennai urban rural epidemiology study [CURES-9]. J Assoc Physicians India, 2005; 53:283-285.
31. Mehta RS, Karki P, Sharma SK. Risk factors, associated health problems, reasons for admission and knowledge profile of diabetes patients admitted in BPKIHS. Kath Univ Med J (KUMJ), 2006; 4:11-13.
32. Baradaran H, Jones K. Assessing the knowledge, attitudes and understanding of type 2 diabetes amongst ethnicgroups in Glasgow, Scotland. Practical Diabetes International. 2004; 21(4):143-148.
33. Binhemd TA. Diabetes mellitus: knowledge, attitude, practice and their relation to diabetes control in female diabetics. Ann Saudi Med. 1992; 12(3):247-251.
34. (KAP) study of diabetes mellitus among patients attending KlinikKesihatan Seri Manjung. NCD Malaysia, 2003; 2:6-16.
35. Welschen LMC, Bloemendal E, Nijpels G, Dekker JM, Heine RJ, Stalman WAB. *et al*. Self-monitoring of bloodglucose in patients with type 2 diabetes who are not using insulin: a systematic review. Diabetes care. June. 2005; 28(6):1510-1517.
36. Mc Elanay IC, Andrews J. The importance of patient education and patient involvement in the treatment of diabetes. Pharma J, 2000, 265.
37. Suppapitiporn S, Chindavijak B, Onsanit S. Effect of diabetes drug counseling by pharmacist, diabetic disease booklet and sp.