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From the Editor

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(Chief Editor)

Diabetes is one of the growing health problems in the Middle East region in general and the Gulf region in particular. Increasing population numbers in the region exposes a large number of the population to diabetes and its complications. This issue is fully dedicated to Diabetes Mellitus. It is rich with papers from various part of the world including India, Turkey, Yemen and the Gulf.

A paper from Turkey investigated whether oligofructose and polydextrose consumption could improve the metabolic control parameters in women with NIDDM. The study was performed on twenty voluntary postmenopausal women. The authors concluded that individual diabetic diets supplemented with prebiotics improved metabolic control parameters in NIDDM.

A retrospective from Yemen aims to determine the prevalence of metabolic syndrome (MS) among type 2 diabetic patients. The total number of patient records reviewed were 460 (males=260 and females=200). The diagnosis of MS applied was according to WHO criteria, which is the presence of hypertension, obesity and type 2 diabetes. The results indicate that the total number of patients who had MS were 139/460, with overall prevalence rate of 32.2 %. The males were 65/260 (25% and females were 74/200 (37%). The authors concluded that metabolic syndrome is considerably high among diabetic patients, therefore they are more vulnerable to cardiovascular diseases and, gives a call for more healthcare of diabetics.

A cross sectional study from Saudi Arabia assessed health difficulties facing diabetic patients in fasting during Ramadan. A total of 204 adult male diabetic patients were included in the study. The majority of patients hadtype 2 diabetes mellitus (97.1%), and (2.9%) had type 1 diabetes mellitus. The authors concluded that the majority of type 2 diabetic patients fasted during Ramadan without difficulties, and most of them had adjusted their oral hypoglycemic agents. It is important and essential for primary health care physicians to educate their Muslim diabetic patients before Ramadan fasting, to clarify any misconception about adjustment of their hypoglycemic agents and insulin during Ramadan, and to avoid preventable complications like hypoglycemia which is sometimes fatal. Further community based studies are recommended to study diabetic patients' medical issues during Ramadan.

A paper from India looked at Awareness Regarding Self Care among Diabetics in a cross-sectional study which was carried out on the diabetic patients attending out patient clinics at three randomly selected rural primary health centers. The diabetics in the area under study had a poor level of awareness about the disease, its complications and self-care. It was further observed that only a few of them had put their knowledge into practice. The authors concluded that improving patients' knowledge and skills regarding diabetes self-care practices will allow them to better contribute to their care thereby postponing, if not avoiding, long-term complications.

A retrospective study from Suadi Arabia attempted to evaluate the efficacy of the diabetic center in Gurayat General Hospital before and after commencement of work in this center. Medical records of patients admitted to surgical wards due to diabetic foot lesions during the period from January 2005 to December 2006 were reviewed. The authors concluded that the services presented by the diabetic center towards diabetic foot care were affecting obviously the outcome of the diabetic patients suffering from diabetic foot lesions attending Gurayat General Hospital.

Dr Al-Ajlan A looked at the emerging challenges of diabetes. The author stressed that one the greatest challenges faced by the modern world is diabetes mellitus. The physical, social and economic factors involved in the management of diabetes are a continuous strain for the health sector and the government agencies. It is expected that approximately 366 million people will be affected by diabetes mellitus by the year 2030.

A second paper from Turkey evaluated the knowledge, attitude and behavior of diabetes mellitus patients who are a target group for influenza vaccination. In addition, the authors compared the change in their vaccination status after training. A questionnaire comprised of 25 questions was administered to the patients. Thirty patients had training on influenza and influenza vaccination in September 2005. Influenza vaccination and having influenza disease was asked at the end of the influenza season. The authors stressed that diabetes mellitus patients in their study group have been vaccinated at a very low percent with influenza vaccine and there was no one who had pneumococcal vaccine.

Dr Ahmed AA rviewed the issue of prevalence and risk factors for diabetic foot in Saudi Arabia. The author stressd that demographic and social changes have led to increased prevalence of diabetes in his country. Then he discussed the fact that dDiabetic foot lesions may face diabetic patients at any time in their diabetes life. It is estimated that approximately 15% of all people with diabetes will be affected by a foot ulcer during their lifetime. He discussed use of offloading devices used to decrease the pressure over a wound and protect wounds, so to give the wound a good chance of healing.

We welcome our South Asia readers who are joining the MEJFM family, and we are putting out a call for papers from the wider region.

Diabetes and Vaccination

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Introduction

Influenza is a febrile disease, which is seen almost every winter and caused by influenza A and B viruses. Every year 5-20% of the population of the United States of America contracts influenza.

Two hundred thousand patients are hospitalized due to the complications of it, and 36,000 deaths occur due to influenza. In Germany, 600 patients die because of AIDS, 8,000 due to traffic accidents, whereas 16,000 deaths due to influenza have been reported[1-3].

Vaccination is necessary for the primary protection from influenza[4,5]. World Health Organization has indicateddiabetes mellitus patients as a target group for influenza vaccination because of their increased risk.

The aim of this study was to evaluate the knowledge, attitude and behavior of diabetes mellitus patients who are a target group for influenza vaccination. In addition, it was also planned to compare the change in the vaccination status after training.

Methods

Patients

Diabetes mellitus patients who admitted to the Family Medicine and Ophthalmology Departments of Erciyes University Medical Faculty, and Family Medicine Department of Afyon Kocatepe University Medical Faculty between June-September 2005 were included in the study.

Patients selected were undergoing regular ophthalmologic examination for their diabetic retinopathy treatment and periodic health examination at Erciyes University Medical Hospital and were undergoing periodic health examination at Afyon Kocatepe University Medical Hospital.

Erciyes University Medical Faculty Ethical Committee has approved this study. Informed consent was obtained from the patients.

Questionnaire

A questionnaire comprised of 25 questions was administered to the patients. Thirty patients had training on influenza and influenza vaccination in September 2005. Influenza vaccination and having had influenza disease was asked at the end of the influenza season.

A comprehensive standardized questionnaire, which was designed to evaluate vaccination status of diabetes mellitus patients by Wahid et al., was used6. Our data collected by direct questioning included age, gender, marital status, occupation, level of education, occupation and level of education of the spouse, family's monthly income, type of diabetes, therapy, duration of diabetes and comorbid chronic diseases.

The questionnaire was validated for Turkish. A pilot study was performed before commencement of the study. The data was obtained from diabetes mellitus patients in a personal interview.

The questionnaire was performed between June 2005 and September 2006.

Patient training and vaccination results

The patients were invited to attend a training session on influenza and influenza vaccination following the cessation of the administration of the questionnaire. The invitation was made by phone calls, and patients who lived in the city center were preferred in order to achieve easier access to hospital. The patients were trained on influenza and influenza vaccination for an hour.

The vaccination status of all of the patients was questioned at the end of influenza season of 2005-2006, in June 2006, by telephone survey. In addition, epidemiological diagnosis criteria of World Health Organization for influenza (fever over 38°C, cough, headache, and muscle pain) were asked of the patients for differential diagnosis.

Statistical analysis

Chi-squared test was used to define the significance of the data of the patients on getting vaccinated for influenza. Univariate logistic regression analysis was used to evaluate the effects of patient properties on vaccination status. These properties were age, gender, area, income level, type, duration and therapy of diabetes, occupation, education level, and comorbid conditions. $P<0.05$ was considered statistically significant.

Results

Patient characteristics

Two hundred and three diabetes mellitus patients were enrolled in the study. Of the patients, 55% (112) were women and 45% (91) were men. The mean age of the diabetic patients was 57±10 (range 25-81) years. Duration of diabetes was 12±8 (0-40) years (mean±SD (range)).

Fifty-two percent (n=105) of the patients were housewives, and 25% (n=52) were retired.

Eight (3.9%) of the 203 had Type 1 diabetes, 46.3% had hypertension, 17.7% suffered from coronary artery disease, 10.3% had chronic pulmonary disease, 5.9% had chronic renal disease, 3.4 had chronic liver disease, and 0.9% had had a stroke. There were no patients with a known immunodeficient state. Five patients had died during the study period. Deaths were not related to pneumonia.

Vaccination status

Overall, 18 (8.8%) (95% confidence interval (CI)) = (5.34-13.65) participants reported that they had influenza vaccine during the previous influenza season. Pneumococcal vaccination was reported by none of the participants.

The rate of patients who would like to get an influenza vaccine the next season was 26.6% (n=54). In total, 44 (21.6%) patients were influenced to get their influenza vaccine. Physicians were those who most commonly suggested vaccination to these patients (46.2%, n=25). The commonest reason cited for not having had an influenza vaccine was 'not being aware of the need' (47% n=96). In addition, 12.8% (n=26) stated that an influenza vaccine had never been offered. Of the patients who got influenza vaccine (n=18), all were given this suggestion by doctors. Nine got one vaccine during the past five years, 5 got it twice, and 4 got it three or more times.

The intention of getting pneumococcal vaccine the next season was 11.8% (n=24). Twenty-three (11.3%) patients were recommended to get their pneumococcal vaccine. Physicians most commonly suggested pneumococcal vaccination to these patients (5.9%, n=12). Fifty-seven percent of pneumococcal nonvaccinees (n=116) stated 'not being aware of the need' as the most common reason for being a nonvaccinee. Forty-seven (23.2%) stated that pneumococcal vaccine had never been offered to them.

Age, gender, marital status, geographical area, education level, occupation, type, duration and therapy of diabetes mellitus, and comorbid chronic diseases did not have a statistically significant effect on vaccination uptake (p>0.05) (Table 1).

Univariate logistic regression analysis only revealed the effect of education level on vaccination status (odds ratio (OR) (95% CI) = 0.341 (0.123-0.946) (Table1). The possibility of being a nonvaccinee was increased 2.93 times for the patients with education level of primary school or less.

Telephone survey after influenza season

At the end of the influenza season in 2006, the patients were telephoned and some questions regarding influenza and influenza vaccine were asked. A patient was called on three different days when not reached. Forty-five patients could not be reached overall. Five of those who had training (Table 2).

World Health Organization's epidemiological diagnosis criteria for influenza used to differentiate between influenza and the common cold (Table 2). There was no statistically significant difference for being vaccinated between the group who had training and the rest of the study group (p=0.511). However, there was an increase in the rates when compared with the previous season (15.1% vs. 8.8%), but this increase was not statistically significant (p=0.07). The rate of having influenza did not have a statistically significant difference between the groups who had training and those who did not (p=0.576).

Discussion

The influenza vaccination rate of 8.8% and no pneumococcal vaccination in our study, is very low when compared with the previous studies regarding these two vaccines in diabetes mellitus patients.

There were only nine studies on influenza and pneumococcal vaccination in diabetic patients from 1993 to 2005 (Table3). Of these, five are from the USA and UK, and the remaining studies are from Belgium, Israel, Greece and Spain. Only four of these studies report both influenza and pneumococcal vaccination rates in diabetic patients. This study is the first study reporting vaccination rates of these two vaccines for diabetic patients in Turkey and the fifth study reporting the vaccination rates of two vaccines in the literature.

The limitation of this study was not being able to reach some patients by telephone survey. In addition, epidemiological criteria for the diagnosis of influenza were not giving the correct diagnosis in many cases. However, it was better to ask these questions rather then directly accepting patients' declaration, to differentiate between influenza and common cold.

The reported rates of influenza vaccination in diabetes mellitus patients vary from 44% to 62.1%[6-13], and 2% to 35% for pneumococcal vaccination[6,8,9,13].

The Healthy People 2010 public health goals are to administer the influenza vaccine to 90% of diabetic adults >65 years and 60% of diabetic adults <65 by the year 2010[14]. It has been reported that there are no UK recommendations as to the minimum vaccination rate that is desirable in diabetic patients. Although the influenza and pneumococcal vaccines were provided free of charge, a concerted media campaign had never been conducted and no incentive was provided for primary care health professionals to achieve a high vaccination uptake[6]. There is no consensus on the minimum vaccination rates of diabetes patients in Turkey as well. In addition, a total of 2.5 million doses of vaccines were available on the market for the 2006-2007 influenza season, which will probably not be enough for the vaccination of 60% of diabetic patients. The vaccines are provided free of charge for diabetic patients, however the patients are not aware of the necessity of vaccination. The level of being unaware of the need for vaccination was 47% in our study was high and similar to the findings of 69% by Wahid et al and 68% by Sotiropoulos et al[6-13].

Sotiropoulos et al have stated the importance of primary care physicians in order to achieve optimal vaccination rates, and several repeated physician visits have been recommended[13]. In our study, we did not observe an increasing effect of group training, which support this suggestion.

The existence of comorbid conditions such as IHD, COPD and hypertension has been reported as significant predictors of receiving influenza vaccine[6,13]. Our study did not demonstrate such a relationship probably due to low vaccination rate.

In order to achieve these desired levels of immunization, identification of patients, creation of registers, effective recall and reminder systems have been recommended[15]. The major challenge seems to be the lack of consensus on the necessity of diabetes mellitus patients' vaccination, of the health authorities. In addition, although American Diabetes Association suggests influenza and pneumococal vaccination of diabetes patients, a study from Israel stated that there was no extra benefit for the vaccination of diabetes patients[12,15]. Furthermore, definitive proof of the efficacy of influenza vaccination specifically in people with diabetes is still lacking[15].

Conclusion

This study demonstrated that diabetes mellitus patients in our study group have been vaccinated at a very low percent, with influenza vaccine and there was no one who had pneumococcal vaccine. Our assessment is that high vaccination levels may be achieved after the national health statement of the country, with the collaborative work of primary care and hospital physicians, including diabetes, ophthalmology and nephrology polyclinics. Training programs should be done face to face with each patient in order to increase the vaccination rates. Furthermore, required levels of vaccine should be supplied.

In summary, in order to prevent influenza which causes considerable morbidity and mortality in diabetes mellitus patients, it is important to get the patients vaccinated or at least suggest they get their influenza vaccine at repeated patient visits. Primary care physicians may play a better role in achieving higher rates of vaccination.

References

1. *Mandell GL, Bennett JE, Dolin R. Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases. Churchill Livingstone. New York. In: Treanor JJ. Influenza virus. (2000) 1823-1849.*
2. *http://www.cdc.gov/flu/keyfacts.htm 23.09.2004.*
3. *Vogel GE, Heckler R, Komm Ch, Schottler M, Lange R, Lange W, Wutzler P. Management of influenza in primary care practices. International Congress Series. 1263 (2000) 499-502.*
4. *Wutzler P, Kossow KD, Lode H, Ruf BR, Scholz H, Vogel GE. Antiviral treatment and prophylaxis of influenza in primary care: German recommendations. J. Clin. Virol. 31(2) (2004) 84-91.*
5. *Gubareva LV, Matrosovich MN, Brenner MK, Bethell RC, Webster RG. Evidence for zanamivir resistance in an immunocompromised child infected with influenza B virus. J. Infect. Dis. 178(5) (1998) 1257-1262.*
6. *Wahid ST, Nag S, Bilous RW, Marshall SM, Robinson AC. Audit of influenza and pneumococcal vaccination uptake in diabetic patients attending secondary care in the Northern Region. Diabet. Med. 18 (2001) 599-603.*
7. *Nguyen-Van-Tam JS, Nicholson KG. Influenza immunization; vaccine offer, request and uptake in high-risk patients during the 1991/1992 season. Epidemiol. Infect. 111 (1993) 347-355.*
8. *Center of Disease Control and Prevention. Influenza and pneumococcal vaccination rates among patients with diabetes mellitus in the United States, 1997. J. Am. Med. Assoc. 283 (2000) 48-50.*
9. *Selvais PL, Hermans MP, Donckier JE, Buysschaert M. Reported rates, incentives, and effectiveness of major vaccinations in 501 attendees at two diabetes clinics. Diabetes Care. 20(7) (1997) 1212-1213.*
10. *Brown JB, Nichols GA, Glauber HS. Case-control study of 10 years of comprehensive diabetes care. West. J. Med. 172 (2000) 85-90.*
11. *Egede LE. Association between number of physician visits and influenza vaccination coverage among diabetic adults with access to care. Diabetes Care. 26 (2003) 2562-2567.*
12. *Heymann AD, Shapiro Y, Chodick G, Shalev V, Kokia E, Kramer E, Shemer J. Reduced hospitalizations and death associated with influenza vaccination among patients with and without diabetes. Diabetes Care. 27(11) (2004) 2581-2584.*
13. *Sotiropoulos A, Merkouris P, Gikas A, Skourtis S, Skliros E, Lanaras L, Nikolaou T, Pappas S. Diabet. Med. 22 (2005) 110-111.*
14. *US Department of Health and Human Services: Healthy People 2010: Understanding and Improving Health. 2nd ed. Washington, DC, U.S. Govt. Printing Office, 2000.*
15. *Smith SA, Poland GA; American Diabetes Association. Influenza and pneumococal immunization in diabetes. Diabetes Care. 27 (2004) s1: S111-113.*
16. *Smith SA, Poland GA. Use of influenza and pneumococcal vaccines in people with diabetes. Diabetes Care 23(1) (2000) 95-108.*

The Effect of the Diabetic Centers on the Outcome of Saudi Patients with Diabetic Foot Problems Attending Gurayat General Hospital

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ABSTRACT

The diabetic center in Gurayat General Hospital at Gurayat province is providing multiple services to diabetic patients including foot care for in-patients upon request and out-patients in scheduled appointments. Diabetic foot is one of the major complications affecting diabetic patients. Although it is not so common, it is one of the serious and costly complications. The direct and indirect cost for care increased obviously with diabetic patients suffering from diabetic foot. Number of patients admitted due to diabetic foot problems, duration of stay and numbers of lower limb amputations are parameters for measuring the efficacy of diabetes care for patients with diabetic foot lesions. Through the evaluation of the presence of the diabetic center in a health care institution we want to check if the care inside this center will affect the overall outcome of diabetic foot.

Objective: To evaluate the efficacy of the diabetic center in Gurayat General Hospital before and after commence of work in this center.

Methodology: A retrospective study was designed. Medical records of patients admitted to surgical wards due to diabetic foot lesions during the period from January 2005 to December 2006 were reviewed. The number of monthly diabetic foot cases admitted to surgical wards was detected. The duration of hospital stay was calculated for every patient. Numbers of amputations were detected. Comparison between year 2005 and 2006 was done. Data was analyzed by using home computer with statistical software programs.

Results: During the year 2005, seventy-three (73) cases with diabetic foot lesions were admitted to the surgical wards. The total hospital stay was 614 days. Four cases had undergone lower limb amputation. During the year 2006 forty cases (40) were admitted to the surgical wards due to diabetic foot with a total hospital stay of 561 days. The total amputations were only one case. The differences were statistically significant for the number of admissions (P-value 0.0001), for the duration of hospital stay (P-value 0.0041) and for the number of amputations (P-value <0.000).

Conclusion: The services presented by the diabetic center towards diabetic foot care were affecting obviously the outcome of the diabetic patients suffering from diabetic foot lesions attending Gurayat General Hospital.

Key words: Diabetic Center, Diabetic foot, Multidisciplinary approach

Background

Gurayat province is a border province located in the north west of Saudi Arabia. The population of Gurayat province is more than 125,000 citizens.[1] The prevalence of diabetes mellitus in Gurayat province is around 6-7%.[1] The prevalence of diabetic foot ulcers in Gurayat province is around 5.5%.[1]

Gurayat General Hospital is one of the Saudi Ministry of health hospitals providing secondary medical care services to Gurayat province with a capacity of 220 beds and 10 beds for intensive care. The surgical wards in Gurayat General Hospital contain 70 beds (35 beds for surgical male ward and 35 beds for surgical female ward)

The work started at the diabetic center in Gurayat General Hospital on the 1st of January 2006. Before that date, patients with diabetes were seen at the diabetic clinic at King Faisal Hospital in Gurayat province where there were no facilities for foot care. Patients with diabetic foot lesions were seen at surgical clinics. Before initiating the work at the diabetic center, there were no trained personnel on foot care, no special dressing materials were available and no written protocols for diabetic foot care were established.

After the initiation of the work at the diabetic center, diabetic patients suffering from diabetic foot lesions were seen at the diabetic foot care clinic, which is one of the diabetic center clinics. Although most cases were seen and followed at our center; other cases were seen and followed at surgical clinics.

The diabetic foot care clinic is run by a team composed of two highly trained nurses in foot care, supervised by a highly trained physician in diabetes care. Special dressing materials are available for dressing (Table 6) .The clinic is responsible for the preventive and curative part of care. The diabetic foot clinic saw 13 patients per day of whom 7 patients needed dressing for foot ulcers, 3 patients attended for routine foot screening and 3 patients for foot self care education.

Patients are usually admitted to surgical wards through surgical clinics or through Accident and Emergency department in Gurayat General Hospital. Others attend the hospital with referral forms from the primary health centers or other hospitals in the region.

Gurayat General Hospital is the only hospital with the capability to admit patients with diabetic foot lesions in the region.

Objective:

To evaluate the effect of our diabetic center on the outcome of diabetic foot cases. This was done through comparing the following parameters before and after starting work:

- Number of admissions due to diabetic foot lesions.
- Duration of hospital stay due to diabetic foot lesions.
- Number of lower limb amputations due to diabetic foot.

Methodology

A retrospective study was designed. The medical records of patients admitted to the surgical wards during the period from 1st of Jan 2005 to 29th Dec 2006 were reviewed.

Only medical records of patients admitted due to diabetic foot problems were reviewed. In each month, the number of admissions and the number of amputations due to diabetic foot was calculated. The duration of stay for each patient was calculated. A comparison between these three parameters in year 2005 and year 2006 was done.

Home computer statistical software was used to analyse the data.

Results

During the year 2005, seventy-three (73) cases of diabetic foot were admitted to surgical wards (Table 1). The total duration of hospital stay for those patients was 614 days (Tables 3 & 4).

Four amputations were done during the year 2005 (Table 5) due to diabetic foot problems.

During the year 2006, only 40 cases were admitted to the surgical wards due to diabetic foot problems (Table 2). The total duration of hospital stay was 561 days (Tables 3 & 4). Only one case needed amputation, below the knee, during the year 2006 (Table 5).

There are significant statistical differences on the mentioned parameters (P-value < 0.000). This suggests the high efficacy of the diabetic foot clinic in improving the outcome of patients with diabetic foot problems attending Gurayat General Hospital. Amputation was higher among males with diabetic foot lesions than females (Table 5)

Discussion

Diabetes mellitus is one of the rising health problems worldwide.[2] The importance of this disease depends on its high mortality and morbidity.

Diabetic foot is one of the less common complications but it is among the serious complications of diabetes mellitus.

The diabetic foot lesions may occur in diabetic patients at any time in their diabetes life. It is estimated that approximately 15% of all people with diabetes will be affected by a foot ulcer during their lifetime.[3]

One study done at King Khalid University hospital in Saudi Arabia showed that the prevalence of diabetic foot lesions was 10.4% among the Saudi population.[4] In our center the prevalence of diabetic foot ulcer was 5.5%.[1] In Taiwan the prevalence of diabetic foot ulcers was 2.9%.[5] This variation related to multiple factors such as availability of national registry, ethnicity or abundance of other risk factors to develop diabetic foot ulcer.[5]

The diabetic foot care clinic is one of the diabetic center clinics. This clinic is responsible for the preventive and curative part of foot care.

Thirteen patients attend the diabetic foot clinic per day. The diabetic foot care team are responsible for the routine screening of diabetic patients according to written protocols adopted by the clinic as well as dealing with cases requiring acute or chronic management according to the protocols of the clinic. The diabetic foot care team also follows admitted patients with diabetic foot lesions upon request. Special dressings are used for managing diabetic foot lesions.[6] Choice of dressings depends on the type of lesion. These dressings were highly effective in treating diabetic foot wounds.[7,8] Documentation of the cases was done using digital camera and follow up files were opened for every patient who attends the clinic. Categorization of each lesion is always done first and a management plan designed for each case. Tight blood glucose was also assured. The diabetic foot care clinic in our center is using a written protocol for care based on the National Institute of Clinical Excellency in the United Kingdom.[9] Following written protocols for foot care will facilitate the work and allow patients to get the best expected results.[10]

Early multidisciplinary intervention for diabetic foot cases will prevent the occurrence of major problems.

The multidisciplinary approach inside our center helped the diabetic foot care team to give their patients the best available standards of care, such as frequent check of their blood glucose while they are inside the center, we support them with strips and glucometers for self monitoring inside their houses, provide diet consultation, and sufficient time with diabetic educators and opportunities to meet physicians to improve and re-evaluate their blood glucose control.

In our study we had noticed a statistically significant difference on number of admissions between year 2005 and year 2006 (P-value <0.0001) and on the duration of hospital stay (P-value <0.0001). Interestingly we had noticed that some patients had been admitted for a long time (>2 months) for non-medical reasons. For example in 1427H we had noticed that one patient had been admitted for more than 3 months after below knee amputation due to lack of prosthetic and orthotic facilities in Gurayat province[11]. Infection of the wound was the major cause prolonging duration of hospital stay of patients with diabetic foot (>1 month) especially those with severe deep infection. Also in our study we had noticed that females were staying longer than males but with an admission rate less than males.

In the general population lower leg amputation is suffered by between 5 and 25 people per 100,000; among people with diabetes the figure is between 6 and 8 for every 1,000.[3] There are 3,000 diabetic patients registered in our diabetic registry.[1] According to this, the expected rate for amputation among our registered patients will be 18 - 24 amputations. In our study we had noticed a decline in the number of lower limb amputations to become only one case in the year 2006 which is outlined below. This makes the rate of amputation among our diabetic patients below the expected international rate which was 13 and 3.3 amputation for 10,000 diabetic patients in 2005 and 2006 respectively (P value <0.000).

In year 2006, only one recorded case had undergone amputation due to diabetes.

In our study the mean hospital stay in 2005 was 50.25 + 43.7 days, while it was 46.67+ 43.6 days in 2006. We had noticed that the range of the variables (duration of hospital stay/patients/month) was wide in both years. This is due to the unexpected figure due to the long hospital stay for non-medical reasons. This is noticed obviously in year 2006. In this year one patient stayed for more than 90 days while the maximum stay in year 2005 was 60 days. Interestingly, we had noticed that free beds give surgeons more feasibility to admit patients for a longer time. We had noticed that the non-medical indications and the presence of osteomylitis were the tow major reasons for increasing the hospital stay more than 30 days.

In one study done by Akbar D and Qari F they found that the mean hospital stay was 21.44 + 17.7 days.[12] In another study done in Riyadh the mean hospital stay was 47.6 days.[1] In our study, if we exclude cases with non medical indications for hospital stay, our findings on the duration of hospital stay will be near the findings of both results.

In our study the number of admitted patients has declined obviously. This is due to the role played by the diabetic foot care clinic. The clinic saw nearly all patients who attended the hospital with diabetic foot. The implementation of programs of early screening for diabetes complications in our center had been successesful in preventing the occurrence of many diabetic foot lesions.

The multidisciplinary approach also helps to decrease the recurrence of diabetic foot lesions. The difference on number of admissions between year 1426H and 2006 was statistically significance (P-value <0.000).

The over-all decrease in the duration of hospital stay, number of admissions and number of amputations decreases successively the cost of diabetic foot care after the initiation of the diabetic center.

One of the limitations of our study is that we cannot calculate those patients who decide to do amputations out of the Guryat General Hospital. We have no link with the higher centers that we usually referred our patients to, to know if these patients have undergone amputation or not. This may weaken our findings in the rate of amputation before and after initiating the work in our center.

The other limitation was that we did not classify type of diabetic foot problems. For clarifying this point, all patients included in our study were patients with foot lesions that necessitated management.

Conclusion

Treating diabetic foot patients inside diabetic centers is more effective than treating them in separate surgical clinics. Diabetic centers can offer the multidisciplinary approach to patients with diabetic foot problems

Recommendations

The idea of diabetes centers should be supported and all patients with diabetic foot problems should be advised to be managemed inside these centers.

References

1. *Almoutaz Alkhier Ahmed. Epidemiology of diabetes in Gurayat Province (unpublished).*
2. *Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes: estimates for 2000 and projections for 2030.Diabetes care 2004; 27:1047-53.*
3. *Karel Bakker and Phil Riley. The year of the diabetic foot. Diabetes Voice, volume 50, issue 1, March 2005.*
4. *Sulaimani RA, Famuyiwa OO, Mekki MO. Pattern of Diabetic Foot Lesions In Saudi Arabia: Experience From King Khalid Hospital, Riyadh. Annals of Saudi Medicine 1991; 1: 47-50.*
5. *Chin Hsia Tesng. Prevalence and risk factors of diabetic foot problems in Tiwan. Diabetes Care, volume 26, Number 12, page 3351, December 2003.*
6. *R.Eldor , I raz , A Ben Yehuda and A.J.M.Boulton. New and Experimental approaches tp treatment of diabetic foot ulcers: a comprehensive of emergening treatment strategies.diabet.med.21, 1161-1173 (2004).*
7. *Aristidis Veves, Peter Sheehan, Hau T. Pham. A randomized, controlled trial of Promogran (a Collagen / oxidized regenerated cellulose dressing) vs standard treatment in the management of diabetic foot ulcers. Arch Surg .2002; 137:822-827.*
8. *Bergin S M, Wraight P. Silver wound dressings and topical agents for treating diabetic foot ulcers. Cochrane Database Syst Rev 2006 Jan 25;(1) : CD005082*
9. *The National Institute of Clinical Excellency, clinical guideline 10.type 2 diabetes, Prevention and Management of foot problems. January 2004*
10. *Monica Maria Ortegon, William Ken Redekop, Louis Wilhelmus Niessen. Cost effectiveness of prevention and treatment of the diabetic foot. Diabetes Care 27:901-907, 2004.*
11. *L .A. al-Falahi, M H al-Turaiki. Prosthetics and orthotics: a survey of centers in the Kingdom of Saudi Arabia. Prosthet Orthot Int. 1992 Apr; 16:38-45 1584642.*
12. *Akbar D, Qari F. Diabetic foot: Presentation and treatment. Saudi Med J. 2000 May; 21(5):443-6.*

Table 1: Number of admissions and duration of hospital stay during 2005

Number of Amputations	Duration of hospital stay	Number of admissions	Month
	73	9	**1**
2	67	7	**2**
	23	7	**3**
2	125	8	**4**
	17	4	**5**
	61	8	**6**
	85	8	**7**
	118	9	**8**
	10	2	**9**
	9	2	**10**
	7	2	**11**
	19	7	**12**
4	614	73	**Total**

Table 2: Number of admissions and duration of hospital stay during 2006

Number of Amputations	Duration of hospital stay	Number of admissions	Month
1	108	4	**1**
	48	4	**2**
	139	5	**3**
	85	9	**4**
	4	2	**5**
	25	2	**6**
	25	3	**7**
	6	2	**8**
	37	2	**9**
	56	4	**10**
	28	3	**11**
	0	0	**12**
1	561	40	**Total**

Table 3: Number of patients based on sex

Total	Female patients	Male patients	
74	20	54	**2005**
40	11	29	**2006**
114	31	83	**Total**

Table 4: Duration of hospital stay based on sex

Total	Female patients	Male patients	
641	190	451	**2005**
561	205	356	**2006**
1202	368	850	**Total**

Table 5: Number of amputations based on sex

Total	Female patients	Male patients	
4	0	4	**2005**
1	0	1	**2006**
5	0	5	**Total**

Table 6: Statistical analysis of the data of admitted patients (both males and females) in the year 2005:

Max	Min	Range	Variance	Median	Mode	SD+	S.E.M	Mean	
9	2	7	7.7	7	2	2.77	0.80	5.91	No. of admissions
125	7	118	1913	43	7	43.7	12.6	50.25	Duration of hospital stay

Table 7: Statistical analysis of the data of admitted patients (both males and females) in the year 2006:

Max	**Min**	**Range**	**Variance**	**Median**	**Mode**	**SD+**	**S.E.M**	**Mean**	
9	0	9	4.96	3	2	2.23	0.64	3.33	**No. of admissions**
139	0	139	1901	32	25	43.6	12.95	46.67	**Duration of hospital stay**

Figure 1: Comparison Based on Total Number of Admissions/Month (2005/2006)

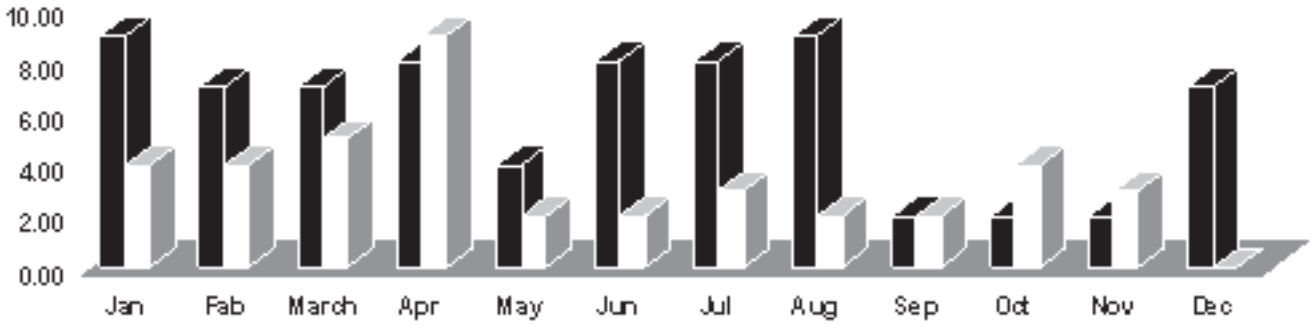


Figure 2: Comparison Based on the Total Number of Admitted Patients (05/06)

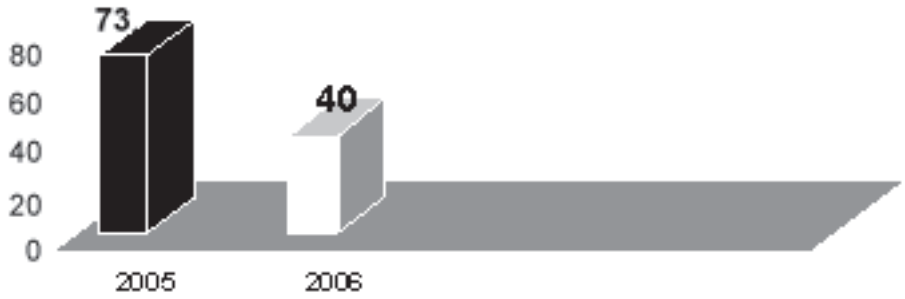
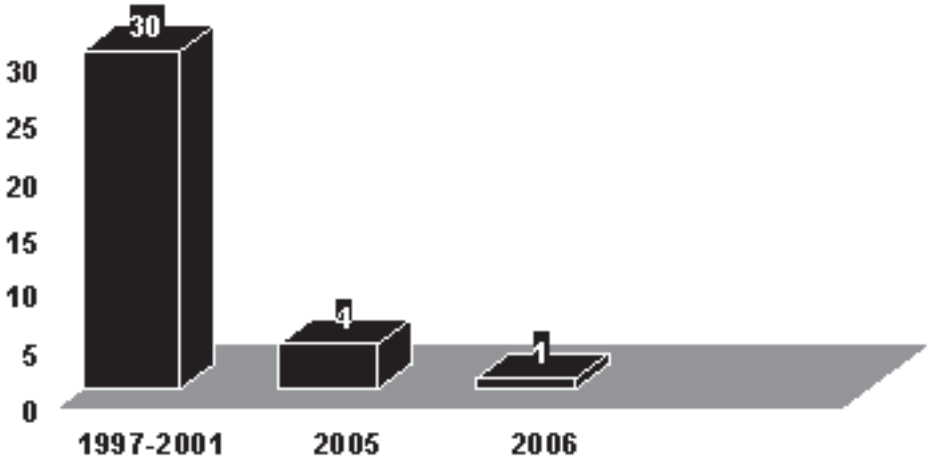


Figure 3: Comparison based on total duration of admissions (05/06)

Figure 4: Comparison Based on Total Number of Amputations 1997-2001/2005/2006



Awareness Regarding Self Care among Diabetics in Rural India

ABSTRACT

One of the greatest challenges faced by the modern world is Diabetes mellitus (DM). The physical, social and economic factors involved in the management of diabetes are a continuous strain for the health sector and the government agencies. It is expected that approximately 366 million people will be affected by Diabetes mellitus by the year 2030.

Diabetes mellitus is a group of metabolic disorders with multiple etiologies characterized by chronic hyperglycemia with disturbance of carbohydrate and fat, resulting from insulin defect in secretion or action.

The new classification of diabetes mellitus given by The Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus in 1997 is universally adopted. Type 1 diabetes appears as a result of autoimmune destruction of beta cells or may be idiopathic. The more common type 2 DM, affecting mostly adults manifests as a result of insulin resistance. The other specific types are impaired fasting glucose (IFG), impaired glucose tolerance (IGT), gestational diabetes and some genetic defects of Beta cells.

The high risk groups of diabetes are Blacks, Hispanics, Indian Americans, people having a BMI of > 27 kg/m2 ,high BP, high cholesterol and having a first degree relative with DM.

According to the 1998 WHO report normal Fasting plasma glucose (FPG) should be less than 6.1 mmol/l and 2 hour plasma glucose less than 7.8 mmol/l . The FPG above 7.8 mmol/l is diagnostic of Diabetes mellitus. The Glycosylated hemoglobin (A1C) is one of the best indicators of diabetes.

Obesity and lack of exercise are the most important factors in precipitating diabetes. Regular screening at an early age of individuals with high risk is strongly recommended. Screening for Gestational diabetes should be done at 24 -28 weeks.

General standards for diabetes management and self management education are recommended. Preventing diabetic complications is the objective.

Diabetes poses a great economic burden on government resources. The US alone has spent 91.8 billion $ on Diabetes in 1992, while England spent 113 million pounds the same year. The Middle East region spent almost 5.2 billion ID in 2003 on diabetes alone. Pakistan, a developing country spent 800 million ID. Saudi Arabia's expenditure on diabetes is estimated to be around 1142 ID. According to WHO records almost one Saudi diabetic patient costs $ 800 per month.

Key words: Classification of Diabetes, Criteria of Diabetes, Obesity, Diabetes cast.

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Introduction

Diabetes mellitus is a disease associated with significant morbidity and mortality[1,2]. Patients with diabetes have higher rates of coronary artery disease, retinopathy, neuropathy and nephropathy1. Many of these complications can be prevented with appropriate medical care[3,4]. This care, however, in addition to taking medications by the patient, often requires significant alterations in lifestyle, (increasing exercise and changing the type of food one eats) and strict adherence to self-care tasks, such as checking urine/blood sugars, to obtain good control of the disease[5]. The importance of self-management skills in diabetes care has also been stressed by the American Diabetes Association (ADA) and the Veterans Health Administration (VHA). Patient education has been proven to be an important method of management of such a community health problem[6]. This study was carried out to assess the level of awareness about the disease and self-care methods and to identify any patient specific characteristics associated with this knowledge. We hope it will form the basis for further research in the future to develop educational strategies to improve patients' self-management skills and hence help to better control the disease.

Materials and Methods

A cross-sectional study was carried out on the diabetic patients attending the out patient clinic at three randomly selected rural primary health centers i.e. PHC Natekal, PHC Boliar, and PHC Amblamogaru in Dakshina Kannada District of Karnataka state in India in 2007. The following patients were excluded from the study: 1) patients with disease duration of less than two years; 2) patients below 18 years of age (still dependent on parents); and 3) patients above 80 years (as they could have senile forgetfulness dementia, etc.). All diabetic patients visiting these clinics except the above were selected for the study. Patients were interviewed by MBBS interns posted at the PHCs by the department of community medicine. The data and responses were recorded on a semi structured pre-tested questionnaire. Patients' level of knowledge was assessed by asking questions on symptoms of hypoglycemia and chronic complications of diabetes. Knowledge about hypoglycemia was considered to be adequate if the patient could correctly recall three of the following hypoglycemic symptoms: sweating, palpitations, hunger, tremor or feeling of impending disaster, each of which can be relieved by taking some food or glucose. Knowledge about chronic complications was assessed and deemed adequate if patients could specify at least three of the following: effect on vision (retinopathy), kidneys (nephropathy), sensation (neuropathy), potency (automatic neuropathy), heart (ischemic heart disease) and on the legs and feet

(peripheral vasculopathy)[7]. Patients' level of self- care was assessed by asking about the following practices carried out at home: 1) urine testing by the dipstick method; 2) blood sugar testing by glucometer, 3) self-injection of insulin; 4) Diet control; 5) Abstinence from alcohol; 6) Abstinence from smoking; 7) Eye care; 8) Foot care; 9) Skin care; 10) Dental care; 11) Regular exercise; 12) Adherence to medication and 13) regular follow up. The responses were recorded as "yes" or "no." All the data were tabulated and analyzed. Chi-squared test was used as a test of significance.

Results

A total of 342 diabetics were studied; 181 (53%) were men and 161 (43%) were women. The majority, 63%, were Hindu, 26% were Christian and 11% were Muslim by faith. The majority 128 (37%) of the respondents were in the age group of 61-70 years, followed by 80 (24%), 68 (20%) and 66 (19%) in the age group of 41-50 years, 51-60 years and >70 years respectively. One hundred and twenty eight (37%) were high school pass followed by 80 (24%) higher primary, 57 (17%) primary, 52 (15%) graduate and 23 (7%) were illiterate. 73% had a per capita monthly income of Rupee 3000 or more.

Table 1 shows that 191 (56%) of the respondents had adequate knowledge about the symptoms of hypoglycemia. Men were found to be more aware than women and this difference was statistically significant. Only 52 (15%) of the respondents knew about the chronic complications of diabetes. Here also men had better knowledge than women but the difference was statistically non-significant. Respondents with per capita income of rupee two thousand or more and having ten or more years of schooling were more aware regarding the disease and its chronic complications. No difference in the awareness was observed across various religious groups.

Table 2 shows the awareness and practices regarding self care among the diabetics. All the 342 respondents were aware regarding diet control but only 148(43%) followed the recommended diet schedules. It was observed that more women (52%) than men (32%) followed the recommended diet schedules. Eighty two percent of the respondents were aware that regular physical exercise is helpful but only nine percent of the men and four percent of the women followed this advice. One hundred and forty one (41%) and 124 (36%) of the total 342 respondents had the knowledge that alcohol and cigarette smoking are harmful for diabetics but only 26 (19%) of the alcohol drinkers and 15 (14%) of the smokers stopped using these products on the advice of their doctor after being diagnosed as diabetics. One hundred percent of the diabetics had knowledge regarding self urine examination at regular intervals. Only 121 (35%) were monitoring their urine sugar level regularly. 227 (66%) of respondents were aware regarding self blood sugar examination and just 11 (3%) were monitoring their blood sugar level at home. Despite the fact all respondents were aware that diabetes is not a curable disease so regular follow up is very important, only 168 (48%) were showing compliance to this advice. Knowledge of the respondents regarding eye, foot and skin care was painfully low, only 52 (15%), 57 (17%) and 38 (11%) of respondents respectively were aware of these and practice was lower still. A minimum 23 (7%) of the diabetics had knowledge regarding dental care and 11 (3%) were visiting a dentist regularly. People across religions had similar levels of knowledge and practice. People with per capita income of less than two thousand rupee and schooling less than ten years had lower knowledge. It was further observed that respondents with a longer duration of disease had a wrong perception that they knew more about the disease and its care, but study found no such difference. No difference was observed across PHCs under study.

Discussion

Diabetes is a disease requiring many types of interventions to prevent the associated morbidity and mortality, which also involves self-care practices that the patient can complete independently. The importance of self-management skills in diabetes care has been stressed by the American Diabetes Association (ADA) and the Veterans Health Administration (VHA). Self care is a crucial element in secondary prevention of diabetes. It requires that the diabetic should take a major responsibility for his/her own care with medical guidance e.g. adherence to diet and drug regimens, home monitoring of urine and blood glucose, self administration of insulin, maintenance of optimum weight, abstinence from tobacco and alcohol, recognition of symptoms associated with glycosuria and hypoglycemia and attending periodic check ups. In order to meet this requirement the diabetic has to make very important and crucial decisions daily. Therefore she/he must have a working knowledge of the disease. The present study has shown that diabetics in the area under study had a poor level of knowledge about the disease and self-care. Similar observations have been made elsewhere also[7,8,9]. It was further observed that the attitude of the diabetics in the area under study, towards the disease, was very casual and only a few of them had put their knowledge into practice. Ruggiero et al, in a nationwide survey of individuals with diabetes, found that over 90% reported always or usually taking their medication but only 64% always or usually followed dietary recommendations and less than half always or usually exercised[10]. Additionally, medical regimens used to treat chronic disease are complicated. Patients may not fully understand the medical rationale behind particular recommendations such as exercise and diet. Furthermore, exercise and diet may not result in immediate improvement in symptoms and often cause initial discomfort or feelings of deprivation, thereby providing little positive feedback and reinforcement. Information provided by home monitoring of blood glucose and urine testing for glucose is a powerful motivating factor[11], encouraging self management of the diabetes by allowing the patient to measure directly the impact of

their behaviour, such as the effect of eating on postprandial glucose, or glucose lowering effect of exercise. Some studies have shown that even in patients treated with diet alone, those who measure their blood glucose more often have better outcomes and those who are highly motivated are likely to do well in the long term[12,13]. Under such circumstances health education is an area which needs to be addressed immediately[14]. Diabetes mellitus has been cited as a model disease in which patient education makes a big difference[15]. Regular assessment of patients' skills and knowledge is critical[16,17]. The American Diabetes Association (ADA) recommends that patients' knowledge of the self-care responsibility be assessed annually and the Veterans Health Administration (VHA) recommends reassessing patient knowledge about diabetes at least three months after an educational intervention[18,19]. This assessment can be easily made by administering a written or oral evaluation with each outpatient visit. Improving patients' knowledge of diabetes self-care practices will allow them to better contribute to their care thereby postponing, if not avoiding, long-term complications. It will be a small investment with a large benefit.

Conclusion

Self care is a crucial element in secondary prevention of diabetes. Diabetics had a poor level of knowledge about the disease and self-care and hence a very casual attitude towards the disease. This predisposes them to the risk of development of complications in later life. Health education is an area which needs to be addressed immediately to improve patients' knowledge and skills of diabetes self-care practices so that they can better contribute towards the management of their disease.

References

1. *National Diabetes Data Group. Diabetes in America. 2nd edition. Bethesda, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases; 1995.*
2. *Saydah SH, Eberhardt MS, Loria CM, Brancati FL. Age and the burden of death attributable to diabetes in the United States. Am J Epidemiol. 2002;156:714-719. doi: 10.1093/aje/kwf111. [PubMed].*
3. *Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes: UKPDS 38. UK Prospective Diabetes Study Group. Bmj. 1998;317:703-713. [PubMed].*
4. *Intensive blood-glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). UK Prospective Diabetes Study (UKPDS) Group. Lancet. 1998;352:837-853. doi: 10.1016/S0140-6736(98)07019-6. [PubMed].*
5. *Standards of medical care for patients with diabetes mellitus. Diabetes Care. 2003;2:S33-50. [PubMed].*
6. *Hassan TA. The centrality of the patient's role in the management of insulin-dependent diabetes mellitus. Saudi Med J 1998;19:370-5.*
7. *Elzubier AG, Al-Amri ADA, Al-Haraka EA, Abu-Samara IO. Self-care, self-reliance and knowledge of diabetes among diabetics in Al-Qassim region, Saudi Arabia. Saudi Med J 1996;17:598-603.*
8. *Hsing-Yi Chang, Chii-Jun Chiou, Ming-Chu Lin, Shu-Hui Lin, Tong-Yuan Tai. A population study of the self-care behaviors and their associated factors of diabetes in Taiwan. Preventive Medicine 2005;40:3:344-8.*
9. *Binhemd TA. Diabetes mellitus. Knowledge, attitude, practice and their relation to diabetes control in female diabetics. Ann Saudi Med 1992;12:247-51.*
10. *Ruggiero L, Glasgow R, Dryfoos JM, Rossi JS, Prochaska JO, Orleans CT, Prokhorov AV, Rossi SR, Greene GW, Reed GR, Kelly K, Chobanian L, Johnson S. Diabetes self-management. Self-reported recommendations and patterns in a large population. Diabetes Care. 1997; 20:568-576.*
11. *Alberti KG, Gries FA, Jervell J, Krans HM. A desktop guide for the management of non-insulin-dependent diabetes mellitis: an update. European NIDDM Policy Group. Diabet Med 1994;11:899-909.*
12. *Karter AJ, Ackerson LM, Darbinian JA, D'Agostino RB, Jr., Ferrara A, Liu j, et al. Self-monitoring of blood glucose levels and glycemic control: the Northern California Kaiser Permanete Diabetes Registry. Am J Med 2001;111:1-9.*
13. *Martin S, Schneider B, Heiemann L, Lodwing V, Kurth HJ, Kolb H, et al. Self-monitoring of blood glucose levels and glucose in type 2 diabetes and long term outcome: an epidemiological cohort study. Diabetologia 2006;49:271-8.*
14. *El-Hazmi MAF, Al-Swailem AR, Warsy AS, Al-Sudairy F, Sulaimani R, Al-Swailem AM, et al. The prevalence of diabetes mellitus and impaired glucose tolerance in the population of Riyadh. Ann Saudi Med 1995;15:598-601.*
15. *Strowig S. Patient education: a model for autonomous decision-making and deliberate action in diabetes self-management. Med Clin North Am 1982;66:1293-307.*
16. *American Diabetes Association. Clinical practice recommendations 2000. Diabetes Care. 2000; 23(suppl 1):S1-116.*
17. *Diabetes Mellitus Working Group. Veterans Health Administration clinical guidelines for management of diabetes mellitus. Version 4.0. Washington, DC: Veterans Health Administration; 1997.*
18. *Brown SA. Studies of educational interventions and outcomes in diabetic adults: a meta-analysis revisited. Patient Educ Couns. 1990; 16:189-215.*
19. *Padgett D, Mumford E, Hynes M et al. Meta-analysis of the effects of educational and pyschosocial interventions on management of diabetes mellitus. J Clin Epidemiol. 1998; 41:1007-30.*

TABLE 1. Level of knowledge in diabetics about the disease

Patient Data		Hypoglycemic symptom awareness		Chronic complications awareness	
Sex	**No.**	**Yes (%)**	**No (%)**	**Yes (%)**	**No (%)**
Men	181	118 (65)	63 (35)	35 (19)	146 (81)
Women	161	73 (45)	88 (55)	21 (13)	140 (87)
Total	342	191 (56)	151 (44)	56 (16)	286 (84)
P value		0.001 (significant)		0.10 (non-significant)	

Values are expressed in mean±SD, n (%).

Table 2 Level of self care among diabetics

Activity	Number of aware persons			Number practicing		
	Men n= 181	**Women n=161**	**Total n=342**	**Men n=181**	**Women n=161**	**Total n=342**
Diet control	181 (100)	161 (100)	342 (100)	64 (35)	84 (52)	148 (43)
Regular exercise	155 (86)	124 (77)	279 (82)	17 (9)	06 (4)	23 (7)
Abstinence from alcohol	95 (53)	46 (29)	141 (41)	26 (19)	NA●	26* (19)
Abstinence from smoking	92 (51)	32 (20)	124 (36)	15 (14)	NA●	15# (14)
Self urine examination	181 (100)	161 (100)	342 (100)	64 (35)	57 (35)	121 (35)
Self blood examination	143 (79)	84 (52)	227 (66)	7 (4)	4 (3)	11 (3)
Adherence to medication	181 (100)	161 (100)	342 (100)	169 (93)	150 (93)	319 (93)
Self administration of insulin	3 (100)	NA●	3 (100)	3 (100)	NA●	3 (100)
Regular follow up	181 (100)	161 (100)	342 (100)	87 (48)	76 (47)	163 (48)
Eye care	33 (18)	19 (12)	52 (15)	14 (8)	9 (6)	23 (7)
Foot care	35 (19)	22 (14)	57 (17)	16 (9)	19 (12)	46 (14)
Skin care	28 (16)	16 (10)	38 (11)	18 (10)	16 (10)	34 (10)
Dental care	14 (8)	9 (6)	23 (7)	7 (4)	4 (3)	11 (32)

●None among the female respondents were using alcohol or tobacco and none was on insulin.
**Out of total 135 persons taking alcohol only 65 were aware and 26 quit after the disease.*
#Out of total 104 smokers only 45 were aware and 15 quit after the disease.

Prevalence of Metabolic Syndrome among Patients with Type 2 Diabetes in Aden Governorate

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ABSTRACT

Background: Metabolic syndrome (MS) (cardiometabolic risk) is a cluster of risk factors that is responsible for much of the excess cardiovascular disease. The components of MS vary according to the definition followed such as: the presence of three metabolic abnormalities from these factors, hypertension, dyslipidemia, obesity and type2 diabetes.

Objectives: This study is a retrospective study to determine the prevalence of metabolic syndrome (MS) among type 2 diabetic patients who attended my private diabetic clinic in Aden Governorate during 2005-2006.

Methods: The total number of patients records reviewed were 460 (males=260 and females=200). The diagnosis of MS applied was according to WHO criteria, which is the presence of hypertension, obesity and type 2 diabetes. The duration of diabetes recorded ranged from a few days to 20 years, and age range was 39-75 with mean age (57 years).

The results indicate that the total number of patients who have MS are 139/460, with overall prevalence rate of 32.2 %. The males were 65/260 (25%) and females were 74/200 (37%). The prevalence of each component of MS among the study patients with type 2 diabetes are, hypertension 50.9 % and obesity 25.4%. Conclusion: Metabolic syndrome is considerably high among our diabetic patients who therefore they are more vulnerable to cardiovascular diseases and a call for more health care of diabetics.

Key words: Metabolic syndrome, type2 diabetes, Aden

Introduction

Metabolic syndrome (MS), also called insulin resistance syndrome or syndrome X[(1)], is a cluster of risk factors that is responsible for much of the excess cardiovascular disease (CVD) morbidity among overweight and obese patients and those persons with type 2 diabetes mellitus[(2,3)].

It is estimated that around a quarter of the world's adult population have metabolic syndrome and they are twice as likely to die from and three times as likely to have a heart attack or stroke compared with people without the syndrome[(4)]. In addition, the clustering of CVD risk factors that typifies the metabolic syndrome is now considered to be the driving force for a CVD epidemic[(5,6)].

The major characteristics of metabolic syndrome as initially defined by an expert panel of the World Health Organization (WHO) in 1998[(7)] includes insulin resistance, abdominal obesity, elevated blood pressure, and lipid abnormalities (i.e., elevated levels of triglycerides and low levels of high-density lipoprotein [HDL] cholesterol). The National Cholesterol Educational Program The NCEP-ATP III[(8,9)] has created an operational definition of metabolic syndrome which is, the co-occurrence of any three of the abnormalities mentioned above, apart from not making waist circumference the central and essential component; the recent ATP III criteria are in line with those of International Diabetes Federation (IDF)[(7,8,10)]. Since there is no internationally agreed upon definition for the metabolic syndrome, the World Health Organization (WHO)[(11)] has recently proposed a working definition based on the signs of insulin resistance: Impaired fasting blood glucose, Impaired glucose tolerance (blood glucose above 140 mg/dl two hours after a 75g glucose challenge). A diagnosis of Type 2 diabetes is automatically included, plus two of the following: Blood pressure (=140 mm Hg systolic or =90 mm Hg diastolic) or taking blood pressure medication.

Plasma triglycerides =150 mg/dL, HDL cholesterol <35 mg/dL in men or <39 mg/dL in women. BMI = 30 kg/m2 and/or waist: hip ratio >0.9 in men, >0.85 in women. Urinary albumin excretion rate =20 µg/min or albumin: creatinine ratio =30 mg/g.

Objectives of Study

The study aims to determine the prevalence of metabolic syndrome among patients with type 2 diabetes, and its relation to gender using WHO criteria.

Patients and Methods

This study is a retrospective study in which we reviewed the records of patients with type 2 diabetes who attended a private diabetic clinic in Aden during the period 2006-2007.

The data obtained from the records includes data of body mass index (BMI), lipid profile and blood pressure records which fulfill WHO criteria for the diagnosis of MS. The patients' records did not include waist circumference, therefore WHO criteria applied were, type 2 diabetes, hypertension (blood pressure =140/90 mm Hg) with or

without medication, dyslipidemia (serum triglycerides 150 mg/dl or HDL cholesterol <35mg/dl) and obesity (BMI = 30kg/ m2). A total of 460 patients (260 males and 200 females) with type-2 diabetes mellitus were screened. Their mean age was 57 years. Age range was 39-75 years. Since all of our patients were type 2 diabetic, the presence of 2 metabolic abnormalities other than DM, is needed to establish the diagnosis of MS. Type 1 diabetic and pregnant patients were not included in the study.

Results

Out of these 460 diabetic patients, 201 (44%) were found to have metabolic syndrome. Among these 201 patients, 119 (59%) were males and 82 (41%) were females, indicating that the disease is more dominant in males, as illustrated in Table 1.

Table 2 shows the prevalence of different components of metabolic syndrome according to gender. Dyslipidemia is a common factor; it was found in 69%, while hypertension and obesity were found in 50.9 and 25.4 respectively.

Discussion

Metabolic syndrome (MS) has received a lot of attention recently because of its importance as a health problem and because of different definitions created by several organizations such as, WHO, IDF, and NCEP ATP111. Patients with Type 2 diabetes, which accounts for 90 % of all diabetes, has become one of the major causes of premature illness and death, mainly through the increased risk of cardiovascular disease (CVD)[3,12,13,14,15] and MS further aggravates the situation. In this study the prevalence of metabolic syndrome was 30.2 % of study patients, and since the prevalence of the MS and its components is mainly dependent on the definition of metabolic syndrome[6,1 6,17], which is still not accepted for all internationally, a single worldwide definition will enable easier comparison of data from different studies, therefore the results of many studies have been controversial. In Saudi patients MS is seen in 56% of patients with Type 2 diabetes, and the commonest component of the syndrome was hypertension as reported by Akbar[18]. Mansour[19] reported the highest prevalence of MS which was 86% (82.7% of males and 94.5% of females) among type 2diabetic patients in Basrah. Huda AL-Ghareeb[20] reported the overall prevalence of metabolic syndrome in her study from Kuwait, was (39.19%). The females were (37.7%) and males (41.1%). In this study the rate is within the range of several studies mentioned above[18,19,20], and hypertension is again the commonest component of metabolic syndrome. The explanation of this increased rate of MS in this study could be due to physical inactivity, sedentary behavior, and unhealthy dietary habits.

Conclusion

- The rate of metabolic syndrome in this study provides a useful tool to identify high risk patients and to institute proper treatment.
- The rate of metabolic syndrome in this study predict an increased burden of cardiovascular disease among Yemeni diabetic over the next few years and call for effective healthcare planning to contain this epidemic syndrome.
- This study is an effort to provide a baseline data for future study using different definitions of metabolic syndrome.

References

1. *Lopez-Candales A. Metabolic syndrome X: a comprehensive review of the pathophysiology and recommended therapy. J Med 2001;32:283-300.*
2. *McNeill AM, Rosamond W, Girman CJ(2004). Prevalence of coronary heart disease and carotid arterial thickening in patients with the metabolic syndrome (The ARIC Study). Am J Cardiol;94:1249-54.*
3. *Vega GL (2001). Obesity, the metabolic syndrome, and cardiovascular disease. Am Heart J; 142:1108-16.*
4. *Alberti KG, Zimmet P, Shaw J (2005); IDFEpidemiology Task Force Consensus Group. The metabolic syndrome a new worldwide definition. Lancet;366:1059-62.*
5. *Ginsberg HN (2003). Treatment for patients with the metabolic syndrome Am J Cardiol;91(7A):29E-39E.*
6. *Isomaa B, Almgren P, Tuomi T (2001). Cardiovascular morbidity and mortality 10associated with the metabolic syndrome. Diabetes Care;24:683-9.*
7. *Alberti KG, Zimmet PZ(1998). Definition, diagnosis and classification of diabetes mellitus and its complications. Part 1: diagnosis and classification of diabetes mellitus, provisi. F onal report of a WHO consultation. Diabet Med;15:539-53.*
8. *Alexander CM, Landsman PB, Teutsch SM (2003). NCEP- defined metabolic syndrome, diabetes and prevalence of coronary heart disease among NHANES III participants age 50 years and older. Diabetes;52:1210-1215.*
9. *National Institutes of Health (2001): Third Report of the National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). Executive Summary. Bethesda, Md.: National.*
10. *Alberti KG, Zimmet P, Shaw J (2006). Metabolic syndrome-a new world-wide defi nition.A Consensus Statement from the International Diabetes Federation. Diabet Med May 23(5):469-80.*
11. *World Health Organization Department of Noncommunicable Disease Surveillance (1999). Definition, diagnosis and classification of diabetes mellitus and its complications: report of a WHO consultation. Geneva, Switzerland: World Health Organization, (Publication no. WHO/NCD/NCS/99.2).*
12. *Liu S, Manson JE (2001). Dietary carbohydrates, physical inactivity, obesity, and the 'metabolic syndrome' as predictors of coronary heart disease. Curr Opin Lipidol;12:395-404.*
13. *13-Malik S, Wong ND, Franklin SS (2004). Impact of the metabolic syndrome on mortality from coronary heart disease, cardiovascular disease, and all causes in United States adults. Circulation; 110:1245-50.*
14. *Meigs JB, Larson MG, D'Agostino RB (2002). Coronary artery calcification in type 2 diabetes and insulin resistance: the Framingham Offspring Study. Diabetes Care 20; 25: 1313-19.*
15. *Reilly MP, Wolfe ML, Rhodes T(2004). Measures of insulin resistance add incremental value to the clinical diagnosis of metabolic syndrome in association with coronary atherosclerosis. Circulation; 110: 803-9.*
16. *Grundy SM, Brewer HB Jr, Cleeman JI, Smith SC Jr, Lenfant C (2004). Definition of metabolic syndrome: Report of the National Heart, Lung, and Blood Institute/American Heart Association conference on scientific issues related to definition. Circulation ; 109:433-8.*
17. *The European Group for the Study of Insulin Resistance (EGIR) (2002). Frequency of the WHO metabolic syndrome in European cohorts, and an alternative definition of an insulin resistance syndrome. Diabetes Metab; 28:364-76.*
18. *Akbar DH (2002).Metabolic syndrome is common in Saudi types 2 diabetic patients .Diabetes International; 12:47-49.*
19. *Mansour A A (2007) The prevalence of metabolic syndrome among patients with type 2 diabetes mellitus in Basrah .Midd.East J.of Family med. vol.5, Iss3.*
20. *Huda AL-Ghareeb (2007): Prevalence of metabolic syndrome in primary care. Middle East Journal for Family medicine Sep.vol.5, issue 6.*

Table 1: Distribution of metabolic syndrome by sex.

Total		Sex				Metabolic syndrome
*%	No	*%	F	*%	M	
44	201	41	82	59	119	Yes
56	259	46	118	54	141	No
100	460	43	200	57	260	Total
P value 0.3 * Percent calculated from total column.						

Table 2 Distribution of different components of metabolic syndrome in type-2 diabetic patients according to gender.

P value	Total		Sex				Diabetics
	%*	No	%**	F	%*	Male	
0.96	50.9	234	51	102	50.7	132	Hypertension
0.0000	69	316	86	172	55	144	Dyslipidemia
0.56	25.4	117	27	54	24.2	63	Obesity
* percent from total male (260). ** percent from total female (200).							

Diabetic Foot: Off Loading Devices

ABSTRACT

It is estimated that approximately 15% of all people with diabetes will be affected by a foot ulcer during their lifetime[1]. Foot problems are very expensive, common and life threatening. In developed countries, up to 5% of people with diabetes have foot problems. In developing countries diabetic foot lesions may face up to 40%[1].

The key to successful pressure reduction in diabetics with foot problems lies more in patient adherence than in prescribed offloading devices. Combining an effective, easy to use offloading device that ensures patient compliance will have a high success rate on reducing the pressure and healing rate.

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Introduction

Diabetic foot lesions may face diabetic patients at any time in their diabetes life. It is estimated that approximately 15% of all people with diabetes will be affected by a foot ulcer during their lifetime[1].

Foot problems are very expensive, common and life threatening. In developed countries, up to 5% of people with diabetes have foot problems[1]. They use between 12 - 15% of health care resources[1]. In developing countries diabetic foot lesions may face up to 40%[1].

In a study done at King Khalid University hospital in Saudi Arabia the prevalence of diabetic foot lesions was 10.4% among the Saudi population[2].

Another study done in Gurayat province showed the prevalence of diabetic foot ulcer was 5.5%[3]. In Taiwan the prevalence of diabetic foot ulcers was 2.9%[4].This variation related to multiple factors such as availability of a national registry, and ethnicity or abundancy of other risk factors to develop diabetic foot ulcer[4].

Offloading devices

Offloading devices are devices used to decrease the pressure over a wound and protect wounds, thereby giving the wound a good chance of healing.

Although many offloading modalities are currently utilized, only small numbers of case series exist describing the frequency and rate of wound healing associated with these devices.

In the following review I will describe the most commonly used modalities and the evidence that supports their employment.

Total Contact Casts (TCCs):

This is the most common modality for offloading used by diabetic foot specialists[5] .This type of offloading was first described by Milroy Paul in treating cases of neuropathic foot wounds and became more popular by Dr.Paul Brand at the Hansen's disease Center in Carville, Louisiana[6].

This modality of offloading is known as total contact cast (TCC) due to the technique used to make it. It employs a well-moulded, minimally padded cast that maintains contact with the entire planter aspect of the foot and lower leg.

TCCs have been shown to reduce pressure at the site of ulceration by 84 - 92%[7]. It is also effective in treating a majority of non-infected, non-ischemic plantar diabetic foot wounds, with healing rates ranging from 72% - 100% over a course of 5 - 7% weeks[8].

Total contact cast is beneficial because it reduces the pressure that occurs in the forefoot of the TCC through transmitting this pressure along the cast wall or to the rear foot[9,10]. It is very effective in treating ulcers in the forefoot and may not be appropriate for heel ulcers because it may apply extra pressure on the posterior foot[10].

The TCCs have other advantages than offloading as shown in Table 1.

Table 1: Advantages of TCCs

- Offloading the foot
- Protect the foot from infection
- Help in reduce or control edema

Although, this modality had success in gaining the attraction of people working in diabetic foot care, it has some disadvantages which make its use by unskilled persons a dangerous practice. Table 2 show some disadvantages of the TCCs[11].

Table 2: Disadvantages of TCCs[12]

- Technically difficult to apply, need special skills.
- Consuming time on its applicationü Improper cast application can cause skin irritation.
- Improper cast application can cause frank ulcerationü Loss of flexibility of daily wound assessment.
- Difficulty in daily life activity such as bathing without wetting the cast
- Users may have difficulty in sleeping comfortably.
- Some designs of TCCs may affect gait stability[8].

TCCs are contraindicated in certain conditions where its application could harm the wound (Table 3)[13].

Table 3: Contraindications for use of TCCs

- For wounds with ischemia
- For infected wounds
- For wounds with osteomylitis

In two randomized controlled trials comparing the proportion of healed ulcers treated with the TCC compared with other popular modalities (RCWs, half shoes and therapeutic depth inlay shoes), TCC healed a higher proportion of wound compared to other modalities[13].

Removable cast walkers and the "instant" total contact cast:

The removable cast walker was designed to avoid the disadvantages of the TCCs. As their names implies; they are removable casts, easily removed. Table 4 shows the advantages of the removable walkers.

Table 4: Advantages of the removable walkers

- Easily removed for self inspection of the wound
- Easily removed for local application of topical therapies
- Easier to enjoy life activities such as bathing, sleeping comfortably.
- Can be used for infected wounds.
- Can be used for superficial ulcers.

Interestingly, data suggests that the amount of pressure reduction for certain RCW is equivalent to TCCs (3). Although data[7] showed that some RCWs reduce the pressure as well as TCCs other[9] data showed that healing with TCCs is more readily achieved than healing with other modalities.

The fact that stands behind this controversy is how the patient behaves towards the removable casts. Because patients can remove RCWs easily, the best feature of this device is potentially the most hazardous point.

In a recently conducted study, Armstrong et al[14] evaluated the activity of patients with diabetic foot ulcers and their adherence to their offloading regime. This study suggests that it is less than 30% of their total daily activity.

Due to the disadvantages of the TCCs, Armstrong et al have suggested an alternative which might make the RCWs difficult to remove.

This alternative called instant total contact cast (iTCC)[15]. Wrapping the RCW with either a layer of cohesive bandage or plaster / fiberglass, making it more difficult for patients to remove.

The great advantage of iTCC is that it binds the benefit of offloading plus the benefit of forced compliance. Two recent randomized controlled trials support this advantage. In the first study, the iTCC appeared to heal as readily at 12 weeks as patients given a standard TCC (80% iTCC versus 74% TCC)[16].The second study compared the iTCC with a standard RCW. This study suggest substantial differences in healing at 12 weeks between the irremovable and removable devices (83% versus 52%)[17].

Scotchcast boot:

It was developed when fiberglass materials were introduced. Its development was to alternate with the plaster of Paris casts. The boot is made to fit each individual foot and a window cut at the site of ulceration

The Scotchcast boot has some advantages as Table 5 shows, suggesting its use[18].

Table 5: Advantages of Scotchcast boot

- Light in weightü Removable and allowing regular inspection of the wound and facilitates the redressing of the wound.
- Reduces pressure on the lesionü Maintains patient mobility.
- ü Protects the wound and remaining foot.

Scotchcast can be made removable or non removable by cutting away the cast over the dorsum of the foot and making a closure of padding and tape with Velcro straps. Windows are cut over the ulcers as needed. The foot is worn with a cast sandal to increase patient mobility while protecting the ulcer from any pressure.

View data are available to assess the efficacy of this modality, but preliminary data of healing rates ranging from 61 - 88% with mean healing time of 10 - 13 weeks have been reported[18].

Half shoes:

This modality of offloading was designed to decrease the pressure on the forefoot postoperatively (19). It became popular for treating wounds in people with diabetes, due to some advantages (Table 6).

Table 6: Advantages of half shoe

- Removable
- Easy to applyü Inexpensive

Chantelau in his paper[19] compared this modality with routine wound care and crutch - assisted gait, suggested that more patients healed faster when using the half shoe and also develop less infections requiring hospitalization. As one of the removable modalities, this benefit could be one of its disadvantages and reduce its efficacy.

Healing sandals:

This is a specially designed sandal with a rigid rocker. This modality may theoretically limit dosrsiflexion of the metatarsophalengeal joints. It provides a greater distribution of metatarsal head pressures[20].

This modality has some advantages that support its use (Table 7).

Table 7: Advantages of half shoe modality

- Light weight
- Stableü Reusable

Also, this modality has some disadvantages as shown in Table 8.

Table 8: Disadvantages of half shoe modality

- Requires significant amount of time and expertise on its manufacture.
- Requires significant amount of time and expertise on its application.

Recently, a hybrid between healing sandals and removable cast walkers has been introduced. This new device is known as the MABAL shoe. In a study by Hissink et al , this device showed a similar time to healing when compared with TCC [21]. Although this device looks excellent, it has some disadvantages like the healing sandal (Table 8).

Felted foot wear:

This is another modality for offloading[22]. It is one of the commonly used offloading devices[18]. It is done by fixing a bilateral felt - foam pad over the planter aspect of the foot with an aperture corresponding to the ulcer site.

Although this technique was used by some centers a debate has been raised on it, particularly on the pressure created around the edges of the aperture[19] but some reports from othercenters advocate its use and showed it to be successful[24].

Crutches, walkers and wheelchairs:

These modalities can offer complete offloading of wounds but they needs upper body strength and endurance. One of the disadvantages of these devices is that they may place the contralateral limb at risk of ulceration by increasing pressure on the unaffected side[25].

Therapeutic footwear:

One of the common practices in diabetic foot clinics is the prescription of therapeutic shoes in an effort to assist in reducing pressure and facilitate wound healing, but is this an evidence based practice?

Unfortunately, the gait laboratory studies suggest that therapeutic shoes allow up to 900% more pressure in areas of the forefoot compared to TCCs and some RCWs.

Theymay help in facilitating healing of superficial ulcers and not offloading an active ulceration[26].

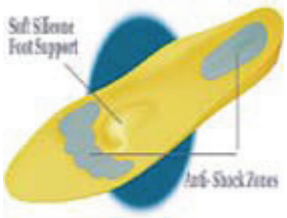
Conclusion

The key to successful pressure reduction lies more in patient adherence than in prescribed offloading devices. Combining an effective, easy to use offloading device that ensures patient compliance will carry high success rate on reducing the pressure and healing rate.

References

1. *Karel Bakker and Phil Riley. The year of the diabetic foot. Diabetes Voice;50(1), 2005.*
2. *Sulaimani RA, Famuyiwa OO, Mekki MO. Pattern of Diabetic Foot Lesions in Saudi Arabia: Experience From King Khalid Hospital, Riyadh. Annals of Saudi Medicine 1991; 1: 47-50.*
3. *Almoutaz Alkhier Ahmed. Epidemiology of diabetes in Gurayat Province (unpublished).*
4. *Chin Hsia Tesng . Prevalence and risk factors of diabetic foot problems in Taiwan. Diabetes Care, volume 26, Number 12, page 3351, December 2003.*
5. *American Diabetes Association consensus development conference on diabetic foot wound care. Diabetes Care 1999; 22(8):1354.*
6. *Coleman W, Brand PW, Brike JA. The total contact cast: a therapy for planter ulceration on insensitive feet. J Am Podiatr Med Assoc.1984; 74:548 - 552.*
7. *Lavery LA,Vela SA,Lavery DC,Quebedeaux TL. Reducing dynamic foot pressures in high-risk diabetic subjects with foot ulcerations. A comparison of treatment. Diabetes Care.1996;19(8):818 - 821.*
8. *Armstrong DG,Lavery LA,Bushman TR. Peak foot pressure influence the healing time of diabetic foot ulcers treated with total contact casts. J Rehabil Res Dev.1998;35(1): 1 - 5.*
9. *Shaw JE,His WL, Ulbercht JS, Norkitis A, Becker MB, Cavanagh PR. The mechanism of plantar unloading in total contact cast implications for design and clinical use. Foot Ankle Int.1997; 18:809 - 817.*
10. *Armstrong DG, Stacpoole-Shea S.Ttotal contact casts and removable cast walkers : mitigation of plantar heel pressure. J Am Podiatr Med Assoc.1999;89:50-53.*
11. *Mueller MJ,Diamond JE,Sinacore DR, et al . Total contact casting in treatment of diabetic plantar ulcers. Controlled clinical trial. Diabetes Care.1989;12(6):384-388.*
12. *Lavery LA,Fleishi JG,Laughin TJ,et al. Is postural instability exacerbated by off-loading devices in high risk diabetics with foot ulcers? Ostomy Wound Manage.1998; 44(1):26-34.*
13. *Armstrong DG, Nguyen HC, Lavery LA,van Schie CH,Boulton AJ,Harkless LB. Offloading the diabetic foot wound: a randomized clinical trial. Diabetes Care 2001;24(6):1019-1022.*
14. *Armstrong DG,Lavery LA, Kimbriel HR, Nixon BP, Boulton AJ. Activity patterns of patients with diabetic foot ulceration: patients with active ulceration may not adhere to a standard pressure offloading regimen. Diabetes Care.2003;26(9):2596-2597.*
15. *Armstrong DG, Short B, Espensen EH, Abu-Rumman PL, Nixon BP, Boulton AJ. Technique for fabrication of an "instant total contact cast for treatment of neuropathic diabetic foot ulcers. J Am Podiatr Med Assoc.2002; 92:405-408*
16. *Katz IA,Harlan A,Miranda- Palma B, et al . A randomized trial of two irremovable off-loading devices in the management of plantar neuropathic diabetic foot ulcers. Diabetes Care.2005;28(3):555 - 559.*
17. *Armstrong DG,Lavery LA,Wu S, Boulton AJ. Evaluation of removable and irremovable cast walkers in the healing of diabetic foot wounds: a randomized controlled trial. Diabetes Care.2005; 28: 551- 554.*
18. *Burden AC,Jones GR,Jones R,Blandford RL. Use of the Scotchcast boot in treating diabetic foot ulcers.Br Med J (Clin Res Ed). 1983;286 (6377): 1555 - 1557.*
19. *Chantelau E,Breuer U,Leisch AC, Tanudjada T, Reuter M. Outpatient treatment of unilateral diabetic foot ulcers with half shoes. Diabet Med.1993;10:267-270*
20. *Giacalone VF,Armstrong DG,Ashry HR, et al. A quantitative assessment of healing sandals and postoperative shoes offloading the neuropathic diabetic foot. J Foot Ankle Surg.1997;36(1):28 - 30.*
21. *Hissink RJ,Manning HA,van Baal JC. The MABAL shoe : an alternative method in contact casting for the treatment of neuropathic diabetic foot ulcers. Foot Ankle Int . 2000;21 (4) : 320 - 323.*
22. *Guzman B,Fisher G,Palladino SJ,Stavosky JW. Pressure - removing stratigies in neuropathic ulcer therapy.Clin Podiatr Med Surg.1994;11(2):339-353*
23. *Armstrong DG , Athanasious KA. The edge effect : how and why wounds grow in size and depth . Clin Podiatr Med Surg.1998:105-108.*
24. *Myerly SM,Stavsky JW. An alternative method for reducing plantar pressures in neuropathic ulcers. Adv Wound Care.1997;10(1):26-29.*
25. *Armstrong DG, Liswood PL, Todd WF: The contralateral limb during total contact casting : a dynamic pressure and thermometric analysis. J Am Podiatr Med Assoc.1995;85(12):733-737.*
26. *Gentzkow GD, Iwasaki SD, Hershon KS. Use of dermagraft, a cultured human dermis, to treat diabetic foot ulcers. Diabetes Care.1996; 19:350 - 454.*

Gallery of some offloading devices

Total contact cast	Removable cast	Scotchcast boot	Healing sandal
	  	  	 
Crutches & wheelchair	Therapeutic foot wear	Silicone insoles	
  	 		

Emerging Challenges of Diabetes

ABSTRACT

One of the greatest challenges faced by the modern world is Diabetes mellitus (DM). The physical, social and economic factors involved in the management of diabetes are a continuous strain for the health sector and the government agencies. It is expected that approximately 366 million people will be affected by Diabetes mellitus by the year 2030. Diabetes mellitus is a group of metabolic disorders with multiple etiologies characterized by chronic hyperglycemia with disturbance of carbohydrate and fat, resulting from insulin defect in secretion or action. The new classification of diabetes mellitus given by The Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus in 1997 is universally adopted. Type 1 diabetes appears as a result of autoimmune destruction of beta cells or may be idiopathic. The more common type 2 DM, affecting mostly adults manifests as a result of insulin resistance. The other specific types are impaired fasting glucose (IFG), impaired glucose tolerance (IGT), gestational diabetes and some genetic defects of Beta cells. The high risk groups of diabetes are Blacks, Hispanics, Indian Americans, people having a BMI of > 27 kg/m2 ,high BP, high cholesterol and having a first degree relative with DM.

According to the 1998 WHO report normal Fasting plasma glucose (FPG) should be less than 6.1 mmol/l and 2 hour plasma glucose less than 7.8 mmol/l . The FPG above 7.8 mmol/l is diagnostic of Diabetes mellitus. The Glycosylated hemoglobin (A1C) is one of the best indicators of diabetes.

Obesity and lack of exercise are the most important factors in precipitating diabetes. Regular screening at an early age of individuals with high risk is strongly recommended. Screening for Gestational diabetes should be done at 24 -28 weeks. General standards for diabetes management and self management education are recommended. Preventing diabetic complications is the objective.

Diabetes poses a great economic burden on government resources. The US alone has spent 91.8 billion $ on Diabetes in 1992, while England spent 113 million pounds the same year. The Middle East region spent almost 5.2 billion ID in 2003 on diabetes alone. Pakistan, a developing country spent 800 million ID. Saudi Arabia's expenditure on diabetes is estimated to be around 1142 ID. According to WHO records almost one Saudi diabetic patient costs $ 800 per month

Key words: Classification of Diabetes, Criteria of Diabetes, Obesity, Diabetes cast.

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Introduction

Diabetes is one of the most dangerous consequences of our modern civilization[1]. Decrease in physical activity, increased life span and the world's growing population of obese are among the new factors that aggravate the problem[2-5].

With 10% of total health care expenditure in many countries millions of families will be left to struggle with emotional and financial burden of this debilitating disease[2,6].

A concerted effort of all governments is required to face the challenge by firm commitment to fight this threat through the establishment of diabetic research centers and national institutions[2].

It was observed that diabetes grows faster in developing countries, for example India has the world's largest diabetic population, where 25% of a family's income is consumed on diabetic care[2,6].

Obstacles to treatment and prevention in this case include the lack of well-trained medical personnel, undiagnosed cases, decreased insulin stocks, and lack of coordination. The economic cost of the problem and its complications are enormous for the health care systems. The loss of productivity is also the price to be paid[6].

Knowledge regarding etiology and pathogenesis needs revision of the criteria for early diagnosis, testing, and classification, since management of diabetes depends on these parameters. Education is another cornerstone in this battle. Preventing complications and further disability can be achieved by self-management and educating the diabetic patient. Gathering data and analyzing information from individuals and organizations in this field and the feedback about patient satisfaction may prove to be of great importance[2].

Definition and Description of Diabetes Mellitus:

It is a group of metabolic disorders of multiple etiologies characterized by chronic hyperglycemia with disturbance of carbohydrate, fat, and protein metabolism resulting from a defect in insulin secretion or action, or both[3,8,9,10]. Hyperglycemia is usually associated with long term damage, dysfunction or even failure of various organs especially the eyes, kidneys, nerves, heart and blood vessels[3,11].

There is an increasing tendency to consider diabetes mellitus as a part of metabolic syndrome. The people known to suffer from metabolic syndrome are at a higher risk of complications. It is well documented that the features

of the metabolic syndrome can be present up to ten years before detection of hyperglycemia. Now evidence is accumulating that even people with metabolic syndrome and normal glucose tolerance need early management of the syndrome to prevent morbidity and mortality of diabetes and reducing the cardiovascular risk factor. In fact, the metabolic syndrome (insulin resistance syndrome) requires a much broader perspective than the focus on blood glucose levels alone[9,12,13,14].

In 1985 a new classification was introduced representing a compromise between clinical and etiological classification which included both staging of diabetes based on clinical descriptive criteria and a complementary etiological base[6,8,9,15].

A patient may acquire diabetes because of large doses of exogenous steroids and may appear normoglycemic, and once the gluco-corticoids are discontinued they may develop diabetes many years later9. Another example is gestational diabetes in which the patient may continue to be hyperglycemic even after delivery or may prove to be diabetic many years later.

For the clinician it is important to understand the pathogenesis of hyperglycemia to manage the case effectively. Many diabetic individuals do not fit easily into a single class. The etiological classification highlights the fact that diabetes can be identified even if the patient is normoglycemic5,9.

Classification of Diabetes mellitus:

In 1997, the expert committee on the diagnosis and classification of diabetes mellitus published the following new classification:[16,17].

Type 1: Characterized by beta cell destruction leading to absolute insulin deficiency. It may present itself in two forms:

1. Autoimmune destruction of beta cells of the pancreas:

This form of diabetes accounts for 5-10% of cases previously described as IDDM or juvenile onset diabetes mellitus. The rate of beta-cell destruction is quite variable. Some cases present with ketoacidosis from the very beginning while others, especially the adults, may have only residual beta cell function, enough to prevent ketoacidosis for a long time but regarded as a high-risk group. Insulin is always required to prevent ketoacidosis, coma and death.

Autoimmune destruction of beta cell has multiple genetic predisposing factors and directly related to the surrounding environment[3,8,9,18,19,20].

2. Type 2: Characterized by predominant insulin resistance and relative insulin deficiency or vice versa.

This is the most common form of diabetes mellitus forming 90-95% of diabetic cases. It is highly associated with a family history of diabetes, older age, obesity and lack of exercise[15,21]. It is more common in females especially those with a history of gestational diabetes, and in blacks, Hispanics and Native Americans.

The etiology of type 2 diabetes mellitus is usually multifactorial and probably genetically controlled, but it also has a strong behavioural component. Most patients are obese which causes some degree of insulin resistance. In the long run, those patients are also prone to macro and micro vascular complications[5,15,21].

Other specific types:

Impaired Fasting Glucose (IFG):

In these cases the fasting plasma glucose is higher than normal but lower than the diagnostic limits.

Impaired Glucose Tolerance (IGT):

The fasting plasma glucose is higher than normal and less than diagnostic following administration of glucose load of 75 grams. It is a stage of impaired glucose regulation rather than frank diabetes. Obesity with hyperglycemic disorder is a common manifestation in these cases.

IFG and IGT patients are considered as pre-diabetic and may be euglycemic in their daily life but are still at higher risk of cardiovascular diseases. However, the two lesions are different entities representing two abnormalities of glucose regulation in the fasting and the postprandial state[3,6,8,9,32].

Gestational Diabetes Mellitus (GDM):

This is a form of glucose intolerance in pregnancy with insulin resistance and beta- cell dysfunction. The lesion is usually diagnosed for the first time during pregnancy. Screening of these women in the first trimester is very useful[9,15,18,19].

Genetic defects of beta cell function:

Monogenetic defect in beta-cell function may present with hyperglycemia before the age of 25 years. It is an inherited disease of autosomal dominant pattern[5].

The main insult is impaired insulin secretion without any defects in insulin action.

Genetic defects in insulin action:

These are rare cases resulting from abnormalities of insulin action. Some patients may have acanthosis nigricans. Some females may suffer from civilization or cystic ovaries[5,21].

Exocrine pancreas diseases:

Pancreatitis, cystic fibrosis, pancreatectomy, hemochromatosis or neoplasia; anyone of these conditions that diffusely affects the pancreas can cause diabetes.

Infections:

Many viruses have been associated with type 1 diabetes; HLA and immune markers have been detected in patients with congenital rubella. Coxsackie virus B, cytomegalovirus, adenovirus, and mumps are also linked to some diabetic cases[15].

Endocrinopathies:

In conditions like acromegaly, Cushing's syndrome, glucagonoma, phaeochromocytoma, and hyperthyroidism, the hormones antagonize insulin action. Hyperglycemia resolves when the level of these hormones returns to normal[15].

Drug or chemical induced:

Vacor, pentamidine, nicotinic acid, glucocorticoids, thyroid hormone, diazoxide, beta-adrenergic agonists, thiazides, phenytoin or Alfa-interferon may impair insulin secretion.

Uncommon immune diseases related to diabetes:

Stiff-man syndrome and systemic lupus erythematosus are examples of this category where anti-insulin receptor antibodies are detected.

Rare genetic syndromes associated with diabetes:

Down's syndrome, Klinefelter's syndrome, Turner's syndrome, Wolfram syndrome, Friedreich's ataxia, Huntington's chorea, Lawrence-moon Beidel syndrome, myotonic dystrophy, porphyria, Prader-Willis syndrome[3,5,8,9,18,19].

Clinical manifestations and diagnostic criteria of diabetes mellitus:

Although most of the cases do not require sophisticated equipment for diagnosis of diabetes mellitus, the majority of cases are detected incidentally. The common symptoms of diabetes are frequent urination, polydypsia, unexplained weight loss, refraction errors, tiredness with the least effort, pruritis, slow healing sores, peripheral neuropathy including tingling and numbness sensation in the hands and feet[22,23].

Inadequate treatment and negligence may lead to the slow development of complications like Ketoacidosis, particularly in children.

In adults coma and nephropathy beginning with microalbuminuria and ending with renal failure, are a few examples of the devastation caused by this disease[1,4,9,23,24,25].

Risk factors of diabetes include ethnic groups; black, Hispanic, American Indian, pacific islander and overweight people with a Body Mass Index over 27 kg per m2, high blood pressure above 140/90 mm of Hg, high cholesterol, having first-degree relative with diabetes mellitus or previous history of gestational diabetes[3,8,26].

Laboratory investigations and clinical testing of diabetes mellitus:

The diagnostic criteria according to the laboratory investigations are changing from time to time, according to the collected epidemiological data. In 1985 WHO has settled a standard test based on 75-g oral glucose tolerance test[3,6,8,25].

WHO has also revised the previous threshold of fasting plasma glucose (FPG) and the 2-h plasma glucose (PG). The data collected showed that most of the patients having 2-h PG above the diagnostic threshold of 11.1 mmol/l have FPG less than the diagnostic threshold of 7.8 mmol/l while the patients with FPG above 7.8 mmol/l have 2h- PG above 11.1 mmol/l[3,6,8,15,25].

In 1997-1998 WHO and ADA suggested the definition of new intermediate stage of disturbed glucose metabolism named as IFG (Impaired fasting glycemia) and a new diagnostic threshold for this stage of 6.1-6.9 mmol/l. was suggested. Accordingly the normal FPG should be less than 6.1 mmol/l, while the 2h PG should be less than 7.8 mmol/l. For some populations at high risk of diabetes (e.g. Asian) FPG threshold is considered even lower than 6.0 mmol/l.

ADA suggested that FPG should be the diagnostic test of choice rather than the 2-h PG for clinical and epidemiological studies since it is simpler and more reproducible[5,9,15,18].

A glycated hemoglobin test also called glycosylated hemoglobin, glycohemoglobin or hemoglobin A1C was introduced as an important tool for diagnosis and follow up of diabetes.

Glycated hemoglobin as a screening test is easier for both patients and clinician because the blood sample can be drawn at the time of the patient's visit to the hospital[3,6].

These updates in diagnostic criteria and the lower cut-off for FPG will increase the number of diagnosed cases. 50% of cases according to the old criteria would remain undiagnosed for many years and those who are asymptomatic and undiagnosed would continue to develop diabetic complications[27,28].

Screening and recommendations:

The prevalence of diabetes worldwide affecting adults above 20 years was estimated to be 171 million in 2000 and expected to be 366 million in 2030[22,23]. The number of people with diabetes is increasing due to population growth, increased life span, urbanization, and lack of physical activity. People above 65 years of age are the most affected lot.

Washington-based World watch institute reported that, for the first time in history, the number of overweight people in the world had outstripped those who are malnourished. Research findings indicate that the prevalence of diabetes will continue to rise even if the level of obesity remains constant.

The percentage of diabetics is much higher in Gulf countries, when compared to the other countries. The rapid change in this area after oil discovery and the marked increase in the family's income in the last three decades has affected the social and economic daily life. Sedentary life also has played an important role in this problem. Looking to the picture globally, it seems to be repeated all over the world; diabetes is prevailing in western countries faster than the developing countries. Modern civilization has produced major changes in the life style and eating habits.

When we come to obesity as one of the major causes of diabetes; the tables do not show a direct relationship between over weight and diabetes.

There is a big debate now about the mechanism that leads to the development of diabetes. It seems that many substances are involved with insulin in the process of homeostasis. Cannaboids, Neuropeptide Y, Ghrelin an Anandamid, along with glucocorticoids and leptin hormones can directly affect metabolism, energy consumption in the body and even appetite. The full mechanism

that regulates insulin secretion, fat storage and energy balance still needs further studies[10,14,18,44,45].

Accurate numbers of people affected now and in the future by diabetes, is essential for rational planning. Out of sixteen million diabetic people in the U.S.A., 700,000 have type 1 diabetes and 15.3 million have type 2 diabetes[18]. Obesity and poor living conditions are mainly related to the prevalence of type 2 diabetes[2],. Eight million did not know that they were diabetic.

In an effort to avoid these missing cases, new recommendations have been introduced by the international panel of experts, and have been endorsed by the national institutes of health. Testing for diabetes should be considered for all persons aged 45 years or higher[18,27]. In the U.S.A. this group is about 77 million. The test should be repeated on another day for those who have shown a high reading and at three years intervals for people with normal results. Investigating this group may lead to the detection of two million new cases.

Groups at high risk of diabetes are;

- An obese person above 120% desirable body weight or body mass index (BMI) above 27 kg/m2.
- First degree relatives of known diabetics.
- People with low HDL < 35MG/dl and / or triglyceride level > 250 mg/dl.
- People who have a previous positive test of IGT or IFG.

The high risk individuals should be tested at a lower age and the test should be repeated more frequently[3,8].

Screening for gestational diabetes (GDM) should be done at 24-28 weeks especially for old, obese, hypertensive women with large babies weighing above 9 lb. About 4% of pregnant women in America develop diabetes during pregnancy resulting in 135,000 cases of diabetes annually. Deterioration of glucose tolerance occurs particularly in the third trimester[5,8].

Some ethnic groups with high risk factors should be tested periodically such as American Indians, Hispanics, Asians, and obese women[5]. Millions of diabetic cases could be diagnosed using these new criteria for screening and testing.

Early diagnosis of diabetes is the crucial factor to prevent eye, heart, kidney and neural damage since the risk of these complications increase sharply when FPG is above 6.1 mmol/l. The American Diabetes Association decided that the fasting plasma glucose test is sufficient for screening and could replace a more expensive, time consuming and unpleasant procedure, the oral glucose-tolerance test. The American Diabetes Association estimates that each year, complications of diabetes result in 54,000 amputations, 12,000 cases of blindness and 178,000 deaths from diabetes and its complications. However routinely reported statistics based on death certification underestimate mortality from diabetes because individuals with diabetes most often die of cardiovascular and renal diseases and not from a cause related specifically to diabetes such as ketoacidosis or hypoglycemia[18].

Metabolic syndrome represents another challenging group in diagnosis and control. The features of the metabolic syndrome can be present for up to ten years before detection of hyperglycemia. This group is at high risk of macro vascular disease. This means that the management of persons with metabolic syndrome should include strategies for reduction of cardiovascular complications[32].

Some recent studies claimed that there is no association between metabolic syndrome and the risk of cardiovascular diseases in elderly. They concluded that elimination of the aging factor with removing the risk imposed by smoking and high cholesterol along with uncontrolled blood pressure will disable any possibility of prediction of heart disease, In a prospective study of paravastatin in the elderly at risk the results showed that there is a four-fold increase in the risk of diabetes mellitus in people suffering from metabolic syndrome. They emphasized the importance of impaired blood glucose testing as a strong tool for prediction of diabetes since the same result showed more than an 18 fold increase in risk of incident diabetes[33].

Epidemiological studies confirm that this syndrome is common in wide ethnic groups including Caucasians, Mexican-American, Asian Indian, Chinese, Australian Aborigines, Polynesians and Micronesians. Central obesity, insulin resistance, hyperinsulinemia with one or more of the following components:

- Raised arterial blood sugar.
- Raised plasma triglycerides.
- Microalbuminuria.
- Hyperuricaemia.
- Coagulation disorders[9,28].

Testing presumably healthy individuals for the presence of any immune markers is not recommended as a routine, probably because accurate values for some assays for immune markers have not been completely established. There is also no agreement yet what action should be taken when a positive test is obtained. There are no definite measures that might prevent or delay the clinical onset of the disease. This type of autoantibody test is mainly useful to detect type1 diabetes only. The cost of such screening is very high since the incidence of type 1 diabetes is low[27,31].

General standards for diabetes management and self-management education:

Once diagnosis of any diabetic case has been made, an effective program for controlling blood sugar must be planned. Preventing diabetic complications is the main objective for any health care unit[2,6,18,22,31].

It is really unacceptable to detect a diabetic case for the first time having a heart attack or hemorrhage in the eye[18].

Most diabetic cases of type 1 develop the disease in childhood or in adolescence, caused by severe deficiency in the hormones. These cases will require insulin therapy to control blood sugar together with some cases from other specific types of diabetes; in certain circumstances

patients classified as type 2 diabetes may even need insulin therapy[32]. For people with type 2 diabetes blood sugar control should start by adjusting diet, encouraging physical exercise and modifying lifestyle. Patients with Type 2 diabetes are more likely to be over weight and hypertensive. Nutrition therapy and exercising may be enough to control some cases, especially the newly diagnosed cases but if these measures fail or the blood sugar is very high; oral medications may be needed[18,32].

The American Diabetes Association estimates that 10 to 20% of people with type 2 diabetes are treated with dieting and exercise, 30 to 40% with oral drugs and the rest with insulin and oral medications.

Diabetic complications can be prevented if the patient is taught how they can take care of themselves in leading an active, healthy life[31,32]. This will depend on receiving good medical advice. Usually the general practitioner is responsible for daily advice in the primary health care centers but patients with risk factors will need thorough care from a specialist or even a team, comprised of professional diabetes educators. A caring support system is also required to deliver effective treatment, and to promote the necessary self-management skills to adapt behavioural changes. This will help to have optimum control on blood sugar. Many countries have established specialized diabetic centers to fulfill these objectives.

A successful dieting program may lead to decrease in caloric intake, reduced body weight, and healthy eating habits, to control blood sugar within normal range. Losing fat is far more important than losing weight[31].

Hyperlipidemia may increase the risk of cardiovascular complications. Many studies showed that caloric control could reduce blood glucose level before any reduction of weight can be seen. Increased physical activity can also increase muscle bulk and improve tissue response to insulin without significant weight loss. Medical nutrition therapy and physical activity is more important for patients with type 2 diabetes[31,32].

Type 1 diabetes usually affects young children. According to the study published in the journal of the American Diabetic Association, daily carbohydrates and caloric intake may be less than required for young children with type 1 diabetes because of rapid growth during the pre-school years.

The same study showed also that the children's daily intake of vitamin B-12 and calcium were below minimum dietary reference intake levels. Patients with type1 diabetes need a well-balanced, nutritionally adequate diet with insulin dose matched to carbohydrate intake, in order to control blood sugar[32].

One of the major complications of type 1 diabetes is diabetic neuropathy. This problem can be treated by giving the patient subcutaneous injections of C-peptide doses. The result of the study proved that the treatment has improved both sensory and motor nerve conduction velocities. Vibration perception threshold has also improved[34].

Drug therapies:

Insulin presents the only choice for patients with type1 diabetes and is used to manage some cases of type2 where blood glucose levels cannot be controlled by diet, weight loss, exercise and oral medications. Using insulin as long-term therapy has many disadvantages. Subcutaneous injections of insulin drain in the peripheral circulation rather than the portal circulation. Its absorption is highly variable making the prediction of the glucose lowering effect very difficult. The different sites of injection have different absorption rates. Abdominal injections absorb faster than the thigh.

Human insulin which has been introduced lately, and is now widely available, is more soluble and more stable than the other forms previously used like bovine insulin. Reports of insulin resistance, allergy and atrophy of subcutaneous fat at the site of injection have decreased sharply after introducing human insulin. Weight gain and hypoglycemia are between the most common adverse reactions of insulin[18,32].

Oral hypoglycemic agents are used to treat type 2 diabetes. This group includes sulphonylureas, biguanides, alpha glucosidase inhibitors and thiazolidenediones. This group improves insulin resistance and stimulates insulin secretion4. Lately some papers have shown concern about the safety of the drugs used to treat type 2 diabetes. Some drugs may contribute to heart diseases or increase the risk of them.

Rosiglitazone which was used for a long time to treat type 2 diabetes has been proved to be associated with a significant increase in the risk of myocardial infarction and with an increase in the risk of death from cardiovascular diseases[18,35].

Anti-diabetic herbal agents have also been used a long time. A study by Atta-ar-Rahman has documented more than 300 plants species accepted for their hypoglycemic properties. Karela (corolla) also known as bitter gourd is a fruit cultivated in India, China, East Africa and South Africa; the studies proved that the fresh juices of this fruit could treat all symptoms of diabetes including polyurea, polydipsia, and polyphagia and can decrease urinary excretion of suga[r32].

Diabetes Self-Management Education (DSME) is very important for any effective health-care related outcomes. Case studies and case report investigations about any successful management strategies confirm the needs of clear goals and objectives. Written commitments, policies, support, and the results will help quality improvement efforts. Reports, documentations and mission statement may help in promoting educational programs. Documentation from small as well as large health organizations provide a solid basis to deliver quality health services.

DSME should determine the target population, assess educational needs according to the ethnic background of the community and education level of the target group and identify the resources to tailor the appropriate program.

For any educational program to be effective, a professional staff comprises behaviorist, exercise physiologist, ophthalmologist, pharmacist, dietitian and registered nurse. There should be a system for continuous re-evaluation and planning after reviewing the process, including data analysis of the outcome measurements and forwarding the recommendations to a concerning governing board[31].

International Comparisons of Diabetes costs

The economic burden of diabetes does not only affect the individual patients and their families but the state and health services on the whole. Study shows the costs of diabetes in 1992 in U.S. was $ 91.8 billion. The direct medical costs of diabetes, and its complications were $ 45.2 billion. Indirect costs were $46.6 billion. It is about 13% of U.S. healthcare expenditure[36].

The estimated direct medical costs of type 1 diabetes in England and Wales in 1992 were £95.6 million; indirect costs were £ 113 million[36]. The cost of Diabetes in the U.S. was estimated at $ 132 billion in 2002 in medical expenditure and as a result of lost productivity[38].

Canadian healthcare systems estimated $ 13.2 billion expenditure on diabetes every year. They predicted that the costs will rise to $15.6 billion a year by 2010 and $19.2 billion a year by 2020[39,40].

In the year 2000-01 Australian diabetes costs burden was estimated at around $ 784 million.

Studies on the costs of diabetes have been conducted in France, Sweden, and Canada. These studies were not comprehensive as of the US. The French study shows that from the total medical expenditure of the selected subjects, the insulin-dependant patients direct cost was 5% and non-insulin- dependent was 8% which was spent on physician visits. In Sweden 14% was spent on physician visits only. Canadian studies showed a 20.9% spent as a direct cost of treatment[35].

The World Health Organization (WHO) estimated the cost of mortalities from diabetes, heart disease and stroke, about International Dollars (ID) 250 billion in the US, ID 225 billion in China and the Russian Federation and 210 billion ID in India in 2005.

In next 10 years WHO estimates that diabetes, heart disease and stroke together will cost about $555.7 billion in China, $303.2 billion in the Russian Federation, $333.6 billion in India, $49.2 billion in Brazil and $2.5 billion in Tanzania. It is expected that in 2007, the world will spend an estimated $215 billion to $375 billion for the care of diabetes and its complications. If nothing is done over the next 20 years, the figure will rise to $234 billion - $ 411 billion[41,43].

The estimated expenditure of the Eastern Mediterranean and Middle East Region (EMME Region) was between 2.8 and 5.2 billion International dollars (ID) in 2003. A less affluent country like Pakistan is estimated to spend between 430 and 800 million ID on Diabetes[43].

Saudi Arabia is estimated to spend between 620 and 1,142 million ID. According to WHO records, almost one Saudi diabetes mellitus person is costing the government about $800 per month. The annual cost of treating diabetes in Saudi Arabia is about $9.6 billion[38,42,44].

References

1. *Taher M Yahya. Diabetic Nephropathy: an emerging challenge in the Arabian Gulf countries. Accessed online. Clinical forum. http://www.ijod.uaeu.ac.ae/iss_0601/4.htm.*
2. *Alberto Cremonesi. Health: Groups lobby U.N. to face diabetes threat. Inter Press News Agency. Accessed on line. http://www.ipsnews.net/news.asp?idnews=34287.*
3. *Jennifer Mayfield. Diagnosis and classification of diabetes Mellitus: new Criteria. American Family Physician.1998.vol 58 /no.6, october15. http://www.afp.org/afp/981015ap/mayfield.html*
4. *Ann Kellett. Diabetes Mellitus Type 2: Overview. Virtual Health Care team. Accessed on line. http://www.vhct.org/case2600/index.htm.*
5. *5. Diagnosis and Classification of Diabetes mellitus. Diabetes Care. 2004; 27:S5-S10, American Diabetes Association, http://care.diabetesjournals.org/cgi/content/full/27/suppl_1/s5.*
6. *Jonathan E. Shaw, Paul Z. Zimmet, Daniet McCarty, Maximition. Type 2 Diabetes worldwide According to the new classification and criteria. Diabetes Care. 2000; 23 (suppl.2) : B5-B10.*
7. *American diabetes association: National Standards for Diabetes Self Management Education. Diabetes Care. 2006; 29: S78-S85.*
8. *Diabetes Care. Diagnosis and classification of Diabetes Mellitus. American Diabetes Association 29(supplement 1): S43-S48, 2006. (Diabetes Care 29:S43-S48,2006) Accessed on line. http://www.care.diabetesjournals.org/egi/content/full/29/suppl_1/s43.*
9. *Reports. Definition, Diagnosis and classification of diabetes Mellitus and its complication. http://www.diabetesmonitor.com/gestationaldiabetes.asp.*
10. *Salim Bastaki: Diabetes mellitus its treatment. Int J Diabetes Metab. 2005; 13:111-134.*
11. *Diagnosis and classification of Diabetes Mellitus. From Diabetes Care. Definition and Description of Diabetes Mellitus. http://www.medscape.com/viewarticle/412642_2.*
12. *National Diabetes Data Group: Classification and diagnosis of diabetes mellitus and other categories of glucose intolerance. Diabetes. 1979; 28:1039-1057.*
13. *Banerji M, Lebovitz H: Insulin sensitive and insulin resistance variants in IDDM. Diabetes 38:784-792, 1989. Diabetes Care. 2003; 26:S5-S20.*
14. *Scott M. Grundy: Metabolic Syndrome: A growing Clinical Challenge. Medscape Cardiology. 2004;8(2) ©2004 Medscape posted 07/29/2004. http://www.medscape.com/viewarticle/484166*
15. *Diagnosis and classification of Diabetes Mellitus. From Diabetes Care. Classification of Diabetes mellitus and Other Categories of Glucose Regulation .Accessed on line. http://www.medscape.com/viewarticle/4126423.*
16. *16. Report of the expert committee on the Diagnosis and Classification of Diabetes Mellitus. Diabetes Care. 2000; 23: (1s) S4-S19, http://www.medseape.com/viewarticle/412642.*
17. *The Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. Classification and Management.*
18. *Diabetes monitor. New classification for diabetes. http://www.diabetesmonitor.com/dx-class.htm.*
19. *George S. E, David K.M. Pathogenesis of type 1 diabetes mellitus, Classification of Diabetes Mellitus and Genetic Diabetic Syndromes. Accessed on line.*
20. *Wahl PW, Savage Pj, Psaty BM et al. Diabetes in older adults: comparison of 1997 America. Diabetes Association classification of diabetes mellitus with 1985 WHO classification. Lancet 1998; 352:1012-5.*
21. *Lisa Nainggolan: New Criteria for Diagnosing Metabolic Syndrome in Teens. Journal of the American College of Cardiology. 2007; 49:891-898.*
22. *22. Middle East News Analysis. Diabetes up by and alarming 40pc in Oman. Accessed on line. http://www.menafn.com/qn_news_story_s.asp?storyId=20928.*
23. *Dr. O.P. Kapoor. Common Chronic Disease patterns in Arabian Gulf, Saudi Arabia & Yemen. Accessed on line. http://www.bhj.org/books/arabs/chap12.htm.*
24. *Michal Shlipak. Diabetic Nephropathy: American Family Physician. 2005; Vol.72/no 11*
25. *Ann Kellett. Diabetes Mellitus Type 2: Diagnostic criteria. Virtual health Care team. Accessed on line. http://www.vhct.org/case2600/dx_criteria.htm.*
26. *Tables- Report of the expert committee on the Diagnosis and Classification of Diabetes Mellitus. Diabetes Care. 2000; 23 (1s) S4-S19. http://www.medseape.com/cotent/2000/00/41/26/412642-tab.hml.*
27. *Diagnosis and classification of Diabetes Mellitus. From Diabetes Care. Testing for Diabetes in Presumably Health Individuals. http://www.medscape.com/viewarticle/412642_5.*
28. *DECODE study Group European Diabetes Epidemiology Study Group. The new diagnostic criteria for diabetes mellitus change phenotype of patients with diabetes? Reanalysis of European epidemiological data. Br. Med J. 1998; 317:317-5. of Diabetes. Diabetes Care. July 1997; Volume 20, Number 7 11:83-1201.*
29. *Grandinetti A, Chang HK, Theriault A, Mor J: Ethn Dis. 2005 Spring; 15(2):233-7. (PMID: 15825969).*
30. *Report of the expert committee on the Diagnosis and Classification of Diabetes Mellitus. Diabetes Care. 2003; 26: S5-S20.*
31. *Report of the expert committee on the Diagnosis and Classification of Diabetes Mellitus. Diabetes Care. 2000. 23 (1s) S4-S19.*
32. *National Diabetes Data Group: Classification and*

diagnosis of diabetes mellitus and other categories of glucose intolerance. Diabetes. 1979;28 :1 039-1057.

33. *Sattar N, McConnachie A, Shaper AG et al: Can metabolic syndrome usefully predict cardiovascular disease and diabetes? Outcome data from two prospective studies. Lancet 2008 doi: 10.1016/S0 140-6736 (08)60602-9.*
34. *Diabetes news. Diabetes today. C-peptide Replacement Improves Early Diabetic Neuropathy. American Diabetes Association. Diabetes Care 2007; 30:71-76.2007. Health Care Professional Edition. http://www.diabetes.org/type-1-diabetes/men-sexual-health.jsp.*
35. *Diabetes Atlas second edition, International Diabetes Federation, 2003. http://www.eatlas.idf.org/Costs_of_diabetes/.*
36. *Omar Ali: Treating metabolic syndrome and type 2 diabetes in children and adolescents. http://www.chw.org/display/PPF/DocID/35352/router.asp*
37. *Olefsky JM, Kolterman OG, Scarlett, JA: Insulin action and resistance in obesity and noninsulin dependent type II diabetes mellitus. AM J physiol. 1982; 243:E15-E30.*
38. *Jonathan C.J: Economic Impact of Diabetes. pp 601-611. Rice DP, Hodgson TA, Kopstein AN: The economic costs of illness: A replication and update. Health care Financing Rev 7:61-80, 1985.*
39. *American Heart Association: Metabolic Syndrome. http://www.americanheart.org/presenter.jhtml?identifier=4756.*
40. *Diabetes News - American Diabetes Association, In Diabetes Today: Dietary Patterns Linked To Type 2 diabetes Risk. 21-Mar 2007. http://www.diabetes.org.*
41. *Steven E.N, Kathy W: Effect of Rosiglitazone on the Risk of Myocardial Infarction and death from Cardiovascular Causes. http://www.nejm.org May 21, 2007 (10.1056/NEJMoa072761).*
42. *Jaime A.D, Osama H: Preventing diabetes in the pre diabetic-part 2. Modern Medicine. February 2007;vol 24; 34- 37.*
43. *Ray NF, Wills S, Thamer M, and Medical Technology and Practice Patterns Institute: Direct and Indirect Cost of Diabetes in the United States in 1992. American Diabetes Association.*
44. *Abdulrahman Alajlan: Diabetic scenario in Arabs. Saudi Med J 2007; Vol. 28 (3), 473-475.*
45. *Bates S.H, Kulkami R.N, Seifert M, and Myers MG: Roles for leptin receptors/STAT3-dependent and independent signals in the regulation of glucose homeostasis. Cell Metabolism 2005; Vol. 1 (3), 169-178.*

Review on the Prevalence of Diabetic Foot and Its Risk Factors in Saudi Arabia

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Introduction

Diabetes is one of the growing health problems in the Middle East region in general and Saudi Arabia particularly. Increase of population numbers in the region exposes a large number of the population to diabetes and its complications. The following review discusses the problem of diabetes in Saudi Arabia, diabetic neuropathy, diabetic vasculopathy, diabetic foot and the impact of education on the quality of foot care. According to our knowledge, this is the first review that shows the magnitude of diabetic foot and its risk factors in Saudi Arabia.

Diabetes in Saudi Arabia:

The Kingdom of Saudi Arabia has undergone a lot of changes in different aspects of daily life habits, towards westernisation. According to Khan, increasing trends in the per capita availability of total food (90%), oils and fats (200%), animal fat (171%), animal protein (207%), meat (313%), milk (120%), eggs (648%) and sugar (68%) have been observed in Saudi Arabia over the period of 60th and 70th.[1] These changes in the years in Japan and 200 years in the United Kingdom.[2]

In recent decades rapid demographic changes have taken place in the form of increasing urbanisation in many parts of Saudi Arabia. Where in the early 1970s, 25% of the Saudi Arabian population lived in urban areas; by the early 1990s more than 75% did so.[3] Urbanisation has been accompanied by changes in the patterns of life style. A steady increase in diabetes prevalence has been noted in Saudi Arabia.

In 1982, *Bacchus RA,* published the first study estimated prevalence of diabetes in Saudi Arabia in a sample of rural men (age 45- 54 years); it was 9.6% and 11% in men >55 years. Fatani et al published a prevalence of 7% and 10.2 % among males aged 35- 54 and > 55 years respectively and 16% and 18.7 % among females aged 35-54 and >55years old respectively.[4] Abu-Zeid in 1997 found that the prevalence of diabetes among men in southern Arabia Saudi was 17 % and 22 % among men aged 41- 50 years and 51- 60 years respectively and 11% and 26% among women aged 41-50 years and 51-60 years respectively.[5]

In 2004, Al-Nozha reported in his national survey for risk factors for coronary artery diseases that the prevalence of diabetes had reached 23.7 %.[6]

Obesity is another health problem among the Saudi population and considered as a risk factor for diabetes and diabetic foot problems.

El-Hazmi et al reported in their national survey which took place in 1997 that the prevalence of overweight in the Saudi population was 22.23% and 25.20% in males and females respectively while obesity was 13.05% and 20.26% in males and females respectively.[7] In 2005, *Al-Nozha et al* reported a new prevalence for overweight and obesity.[8] For overweight, it was 42.4% and 31.8% for males and females respectively, and for obesity it was 26.4% and 44% for males and females respectively. The prevalence of gross obesity (BMI>40m/kg2) was 3.2%.[8]

The high prevalence of inactivity among Saudis represents a major public health challenge. *Al-Nozha et al*[9] showed that the prevalence of inactivity among participants included in the national survey done between 1995- 2000 for the risk of coronary artery diseases in Saudi Arabia was 96.1% which is very high. There were significantly ($p<0.001$) more inactive females (98.1%) than males (93.9%). Inactivity prevalence increases with increasing age category, especially in males, and decreases with increase of education levels. Inactivity was the highest in the central region (97.3%; 95% CI = 96.8-97.8%) and the lowest in the southern region of Saudi Arabia (94.0%; 95% CI = 93.2-94.8%).[9]

In 2008, *Al-Nozha et al*[10] published data that showed the prevalence of dyslipideamia among the Saudi population. They found that the prevalence of High Cholesteremia (total cholesterol > or =5.2 mmol/l) was 54% with mean cholesterol level of 5.4+/-1.52 mmol/l. The prevalence of High Cholesteremia among males was 54.9% and 53.2% for females, while 53.4% among urban Saudis and 55.3% for rural Saudis. For hypertriglycemia (total triglycerides > or =1.69 mmol/l) the prevalence was 40.3% with mean triglycerides level of 1.8+/-1.29 mmol/l. Males had a statistically significant higher Hypertriglycemia prevalence of 47.6% compared to 33.7% in females ($p<0.0001$).

Smoking was another health problem in Saudi Arabia. It is difficult to determine the actual prevalence of smoking due to multiple social and religious barriers, so there has been a considerable variation on the prevalence of smoking among studies done in Saudi Arabia. *Al-Haddad NS, Al-Habeeb TA, Abdelgadir MH, Al-Ghamdy YS and Qureshi NA* concluded in their study published in 2003 that

prevalence of smoking in Al-Gassim region was 52.3%.[11] Although 85% were adult smokers, 8.6% began smoking before age 12. Smokers gave overlapping reasons to smoke including peer pressure; non-smokers gave religious and health logics against smoking.[11] Of all smokers, 92.8% wanted to learn cessation strategies, 11.8% were ignorant of hazards and 32.4% reported manifestations of nicotine withdrawal.[11]

In another study done among health staff in a primary care unit in a general hospital in Riyadh, the prevalence of smoking was 19% and 14% for ex-smokers.[12]

Jamal S Jarallaha et al concluded that the overall prevalence of smoking was 21.1% for males and 0.9% for females. Most smokers (78%) were young to middle-aged (21- 50 years old). Smoking prevalence was higher among married people, among uneducated people, and among those in certain occupations: manual workers, businessmen, army officers, and office workers.[13]

In conclusion, the changes in demography of Saudi Arabia, the pattern of life style and adoption of bad medical habits like tobacco smoking were accused of raising the prevalence of type 2 diabetes mellitus in Saudi Arabia and exposing a large number of the population with diabetes to complications of diabetes.

Risk Factors for Diabetic Foot

Foot examination and risk categorisation were among the least concerning examination by most of the physicians dealing with diabetes.

In a cross sectional study conducted in Gurayat province among primary care physicians to evaluate the current referral system between the diabetic center and the primary health care centers, only 3 referral forms (from a total of 215 forms) contained data about foot examination.[14]

Neuropathy and vasculaopathy were the main determinant risk factors for the occurrence of diabetic foot. Loss of protective sensation stands behind many of diabetic foot ulcers.

Poor glycemic control is considered one of the poor predictors of diabetic foot lesions.

Faiza A Qari and Daad Akbar reported that 79% (27/34) of their studied patients were uncontrolled.[15]

Al-Nuaim AR et al in their paper, studied patterns and factors associated with glycemic control of Saudi diabetic patients and reported that 50% of the patients with type 2 they studied have uncontrolled diabetes (Random blood glucose > 10mmol/L).[16] In this study patients with poor glycemic control were significantly older than patients with good glycemic control (P=0.0001). The researchers concluded that underutilised insulin therapy, given the high rate of poor glycemic control and high rate of relative poor glycemic control and high rate of relative occurrence of complications among Saudi diabetic patients.[16] Another study done by Faiza A Qari compared glycemic control among diabetic at university and Erfan private hospital.[17] She concluded that even after great efforts, a target level of HbA1c was not achieved in both groups of patients - in private and governmental hospitals. Only 58% at King Abdulaziz University Hospital versus 54% at Erfan group achieved an acceptable level (HbA1c<8%).[17] Even in primary health care services, glycemic control was not so good. In a study done by *Azab AS*[18] which targeted patients with diabetes attending primary health care centers in Riyadh (991diabetic patients were involved), 21% of patients achieved excellent glycemic control in the first reading and 25% in the second reading (fasting blood glucose <10mmol/L) while those with poor control represented 49% and 44% of the patients in two readings (fasting blood glucose >10mmol/L).[18]

Peripheral Neuropathy

Diabetic neuropathy is a common complication of diabetes mellitus that eventually affects the majority of diabetic patients and is associated with significant morbidity and disability.[19] It affects sensory, autonomic and motor neurons of the peripheral nervous system. Prevalence of diabetic peripheral neuropathy varies widely due to the different diagnostic criteria. Epidemiological cross-sectional studies are the most appropriate to draw valid conclusions regarding the prevalence of diabetic neuropathy if they are population-based and can obtain response rates. In contrast, hospital-based studies may not reflect the true prevalence of this complication. Recommendations for standardised classification of diabetic neuropathy made by the American Diabetic Association and academy of neurology include measurement of at least one parameter of the five main categories: symptom profile, neurological examination, quantitative sensory testing, nerve conduction studies and autonomic function testing.[20]

It is estimated from a comprehensive collection of epidemiologic studies that the prevalence of neuropathy in diabetes patients is approximately 30% in hospital patients and 20% in community patients.[21]

In 1994, *Kumar et al* reported a higher prevalence rate (41.6%) of neuropathy among patients with type 2 diabetes in a population-based study in three cities in the United Kingdom.[22] The prevalence was 26% in the Oxford community- based study which did not include patients over 75 years.[23]

Nielsen JV reported a prevalence of 38% among Saudi patients with type 2 diabetes within a duration of 10 years.[24] In the same study a comparison of 212 Saudi diabetic patients in the age group 46-69 years were compared with corresponding Swedish patients with type 2 diabetes. No significant difference was noticed between the two groups.[25]

Abdulrahman Al-Tahan, in his paper published in 1994 in the Saudi medical journal reported that the prevalence of diabetic neuropathy was 33.9% and it was the commonest encountered type of neuropathy among Saudis.[25]

An interesting paper published in the Bahrain medical bulletin by Daad H Akbar discussed the discordance between symptoms and electrophysiological testing in Saudi diabetics in diagnosing diabetic neuropathy.[26] In a cross sectional study of Saudi diabetics with symptoms of neuropathy followed up in medical outpatient clinic at King Abulaziz University Hospital between January 1998 to May 1999, neuropathy was diagnosed using the Mitchigan neuropathy program. The prevalence of Normal nerve conduction was 36% and the abnormal conduction was 64 %.[26]

Another interesting study was done by *Abdulsalam A Al-Sulaiman, Hassan M Ismail, Ali I Al-Sultan*[37] on nerve conduction abnormalities among newly diagnosed diabetic patients with type 2 diabetes (within 4 weeks from the diagnosis). The researchers found the presence of these abnormalities in all participants (29 patients) which meant that the prevalence of neuropathy based on their criteria was 100%.[27]

An interesting paper published in the Saudi journal of kidney disease and transplantation found that the prevalence of diabetic neuropathy was 66.8%.[28] This study concluded that baseline creatinine clearance and proteinuria, high systolic blood pressure, advanced age and longer duration of diabetes were the most significant risk factors for developing complications.[28] The interesting part of this study is that from the following complications; angiography proven coronary artery disease, stroke, myocardial infarction, angina, retinopathy, blindness, peripheral vascular disease, neuropathy, hypertension, diabetic foot, amputation and end stage renal disease, 37% of patients developed > 6 concomitant complications, 28% developed 5 concomitant compilications,17% developed 4 and the rest developed <3.[28] This finding may explain the high prevalence of neuropathy among these patients.

Akbar DH, Mira SA, Zawawi TH, Malibary HM, in their paper published in 2000 in the Saudi medical journal pointed to subclinical diabetic neuropathy which they considered as a common complication in Saudi diabetics.[29] They conducted a prospective study extended from January 1998 until April 1999. Patients were assessed for diabetic neuropathy using the Michigan Neuropathy Program.[30] Symptomatic diabetic neuropathy was found in 56% while sub clinical neuropathy was found in 57% of asymptomatic patients.[29]

Reported prevalence of neuroarthropathy among diabetic Saudis was very scarce in the literature. The study done by *Qidwai SA, Khan MA, Hussain SR and Malik MS,* published in the Saudi medical journal in 2001 is among those few studies done on this area.[31] The researchers conducted a retrospective study based on reviewing medical records of 296 diabetic patients between June of 1998 and July of 1999. Included participants had long standing, poorly controlled diabetes mellitus and associated peripheral neuropathy. Participants were evaluated clinically and radiologically for the presence of neuroarthropathic changes in the feet. The researchers found that the prevalence of diabetic neuropathy was 12.5% and 4% for neuroarthropathy.[31] The joints involved were tarsometatarsal (76%), metatarsophalangeal (59%), subtalar (47%) and interphalangeal joints (41%).[31]

Peripheral Vasculopathy

The prevalence of peripheral vascular disease (PVD) is higher among diabetic than non-diabetic patients in both population and hospital based studies.[32,33] True prevalence of PAD in people with diabetes has been difficult to determine due to:

- Most of the patients are asymptomatic
- Many do not report their symptoms
- Screening modalities have not been uniformly agreed upon
- Pain perception may be blunted by the presence of PVD

Data from the Framingham Heart Study, revealed that 20% of symptomatic patients with PVD had diabetes.[34]

When using pulse deficits as criterion for detection of PVD, the researchers on the Rochester, MN which was a population based survey among diabetics diagnosed in 1945 - 1969 found that 8% had PVD at the time of initial diagnosis of diabetes.[35]

In an epidemiological study involving two residential areas in Chennai in south India with 1,262 participants aged > 20 years using Doppler to detect PVD with a cut value of 0.9, the researchers found that among normoglycemic patients the prevalence of PVD was 2.7%, among those with impaired glucose tolerance 2.9% and among diabetics it was 6.3 %.[36]

Sulatn O Al-Sheikh et al conducted a prospective cross sectional study which included 471 Saudi patients aged >=45 years attended the primary health care center at king Khalid university hospital between February - March 2006, using ABI<0.9 to define PAD. They found that the prevalence of PAD was 11.7% and 92.7% of them were asymptomatic.[37]

Faiza A Qari and Daad Akbar retrospectively studied medical notes of 34 diabetic patients admitted to king Abdulaziz University hospital in Jeddah from June 1997 to June 1999 with diabetic foot. They concluded that 50% of those patients suffered from PAD.[38]

Sulimani RA, Famuyiwa OO, Mekki MO, in their retrospective study which was carried out to estimate the magnitude and pattern of foot lesions seen in King Khalid University hospital among diabetics found that the prevalence of PAD was 54.5%.[39]

AbdulRashid S and Ashar AK, in their paper published in the Journal of Surgery of Pakistan reported the results of an analysis of 50 cases of amputations done at Al-Noor Specialist Hospital in Mekkah, and found that there were 43/48 (86%) amputations due to diabetes with peripheral neuropathy and circulatory disorder.[40]

Almoutaz A.Ahmed in his review done in 2006 about the epidemiology of diabetes in Gurayat province found that the prevalence of PAD among patients with type 2 diabetes

attending the diabetic center in the province was 10.5% using symptoms and pulse deficit as criteria for PVD.[41]

Al-Wakeel et al studied 184 diabetic patients with nephropathy between Jan 2003 - June 2006.[42] Researchers found that the prevalence of peripheral vascular disease was 65.7%.[42] This study concluded that baseline creatinine clearance and proteinuria, high systolic blood pressure, advanced age and longer duration of diabetes were the most significant risk factors for developing complications.[42]

Education

Education is one of the important issues that needs to be covered well in patients with diabetes.

The Diabetes Education Study (DIABEDS) was a randomised, controlled trial of the effects of patient and physician education, with patients randomly assigned to experimental and control groups.[43] Patients in the randomised experimental group were offered up to seven modules of patient education. The results of the study showed that there were significantly greater reductions in fasting blood glucose between experimental and control group (-27.5 mg/dl versus -2.8 mg/dl, (P<0.05) and glycosylated hemoglobin (- 0.43% versus + 0.35%, P<0.05) as compared with control subjects.

Iftikar Uddin, Tahir J. Ahmed, AbdurRahman A.Kurkuman and Rahila Iftikar found that education is significantly effective in controlling blood glucose (P<0.005).[44] The mean fasting blood glucose before education started among participants was 10.7mmol/L and became 7.3mmol/L after education.[44]

Alkhaldi YM and Khan MY published an interesting paper auditing diabetic a health education program applied to diabetic patients (198 patients) at a large primary health care center in Asir region.[45] The researchers found that compliance to appointments was good in 60% and poor in 30% of diabetics. Also, they found that 73% of diabetics received at least one health education topic, 27% did not receive any health education at all, and only 33% of diabetic patients had adequate health education. Eighty percent (80%) were questioned about diabetes and 77% were educated about the role of diet. They also found that the essential structure for diabetes education program was found to be unsatisfactory and recommended a structured education program to be applied.

In another interesting study done in a primary health care center in Abha where 475 diabetic patients were registered and followed up, the files of 198 diabetic patients who fulfilled the inclusion criteria set for this study were reviewed.[46] The aim of this study was to examine the impact of health education delivered in the PHC setting on the control of diabetes and to investigate any gender difference affecting the validity of health education message. Males received significantly more health education sessions (4.2+1.9 versus 1.8+1.3 P<0.01). Females had significantly poorer diet compliance than males (P<0.05). The researchers concluded that the only significant factor predicting poor glycemic control was the sex of the patient showing that females are more prone to hyperglycemia and poor control of their diabetic state than males (OR= 2.84) and recommended that female patients should be taken into account when designing health education messages.

Organised follow up using a structured follow up sheet showed significant outcomes. *Moharram MM and Farahat FM*[47] showed that the use of a flow sheet would improve performance of family physicians in diabetes care. Based on a one year intervention study conducted in 7 family practice clinics in Taif Armed Forces Hospitals, Taif, Saudi Arabia from March 2006 to June 2007, the researchers concluded that a flow sheet can be effective in improving quality of care not only for diabetes but also for other chronic conditions.

Mohammed H. AlDoghether, in his study assessed whether it is possible by diabetic foot reminder to improve foot examination of diabetics in primary health care centers.[48] The researcher used pre and post evaluation to measure the effect of the content of the education on the quality of foot examination. The results showed that there was a dramatic improvement of performing foot examination after using the reminders over 4 months. Further improvement might be expected over applying the reminders for a year or more. The researcher advised that one of the main reasons for the success in implementing the diabetic foot examination reminder is the employment of a multidisciplinary approach.

Desmatological Foot Diseases

Literature search for dermatological diseases of the foot among Saudi diabetics refilled very scanty publications.

An interesting national survey done by *Sammer K Zimmo* published in 2007[31] reviewed the common dermatological foot diseases among 4401 Saudi individuals. This survey showed that 43% of the participants had foot diseases. The prevalence of fungal infection was 19.9%; and 15.52% of them were suffered from Tinea Pedis, 5.56% from Onychomycosis and 23% from non fungal diseases.

Of all participants 5.5% had warts and 3.68% had corns.

Skin examination showed that 57% of affected patients had planter hyperkeratosis. 45% had fissures, 10% ulceration.

Diabetes was the third prevalent cause for dermatological foot diseases (12%) preceded by dermatological diseases (42%) and obesity (13%).

Diabetic Foot

Ulceration of the foot in diabetes is common and disabling and frequently leads to amputation of the leg.

In a community survey done in UK, the prevalence of diabetic foot ulcers was 5.3% in patients with type 2 diabetes.[25] Also they found that 7.4% of patients with type 1 and 2 had a history of active or previous foot

ulcers.[25] In USA in a hospital based survey done by Ramsey SD and his colleagues found the prevalence was 5.8%.[50]

In another survey done in Netherlands, a mean incidence of new ulceration among patients with type 2 alone was found to be 2.1% annually.[51]

In a study done in Iran by Afsaneh Alavi aimed to examine the characteristics of patients with diabetic foot ulcers attending an outpatient diabetic clinic in Kerman province which is located in the southeastern of Iran, the investigator examined 247 patients with diabetes with mean age 52+12years, the prevalence of diabetic foot was 4%, callus 12% and 50% for heal cracks.[52]

Nielsen JV[7] found that the prevalence of diabetic foot was 4.7% among a sample of 375 Saudi patients with type 2 diabetes. He did a comparison with a correspondence Swedish diabetic patients (age group 46-69years), prevalence of ulcers was (2.3%) in Saudi group which was significantly lower than in Swedish patients. This finding may explained by different styles of footwear.[24]

Faiza A Qari and Daad Akbar in their paper reported that 59% of their studied patients had foot ulcers (20/34) and 65% of these patients with ulcers need Debridement.[38]

In another study done in King Khalid University Hospital, Riyadh from January 2003- June 2006 included 184 diabetic nephropathy patients who were referred to nephrology clinic; the researchers found that the prevalence of diabetic foot was 13.5%.[28] Also the researchers in this study concluded that baseline creatinine clearance and proteinuria, high systolic blood pressure, advanced age and longer duration of diabetes were the most significant risk factors for developing complications.[28]

Qari FA in her study which aimed to know the characteristics and risk factors of 13 diabetic patients undergoing chronic hemodialysis at King Abdulaziz University Hospital in Jeddah[53] found that 7.7% of the participants had gangrenous foot. She explained her findings to poor glycemic control, inadequate treatment of hypertension, high smoking rate and inadequate screening for microalbuminuria.[53]

Conclusion

The high prevalence of diabetes and the increasing prevalence of risk factors for diabetic foot as well as poor constructed educational programs stand behind the growing prevalence of diabetic foot lesions in Saudi Arabia.

Large community base surveys need to be conducted to assess the current situation and auditing the running programs.

References

1. *Khan MA. Dietary energy and protein requirements for Saudi Arabia: a methodological approach. EMMJ; 4(1):68-75.1998.*
2. *Diet, nutrition and the prevention of chronic diseases. Report of a WHO study group. Geneva, world health organization, 1990 (Technical Report Series, No.797).*
3. *JV Nielsen. Diabetes in the Arab World: Prevalence and risk factors. Practical Diabetes International May 1999; 16(3):82-86.*
4. *Fatani HH,Mira SA,El-Zubir AG.Prevalence of diabetes mellitus in rural Saudi Arabia. Diabetes Care 1987; 10(2):180-83.*
5. *Abu-Zeid HAH,Al-Kassab ASK. Prevalence and health-care features of hyperglycemia in semi-urban-rural communities in southern Saudi Arabia. Diabetes Care 1992; 15(4):484-89.*
6. *Al-Nozha MM, Al-Matouq MA, Al-Mazrou YY, et al. Diabetes in Saudi Arabia. Saudi Med J 2004; 25(11): 1603-10.*
7. *M.A.F.El-Hazmi and A.S.Warsy. Obesity in Saudi Arabia. Ann Saudi Med; 17(3):302- 306.1997*
8. *Al-Nozha et al. Obesity in Saudi Arabia. Saudi Med J; 26(5):824-9.2005.*
9. *Al-Nozha et al. Prevalence of physical activity and inactivity among Saudis aged 30-70 years. A population-based cross sectional study. Saudi Med J; 28(4):559-68.*
10. *Al-Nozha et al. Hyperlipidemia in Saudi Arabia. Saudi Medical Journal ; 29(2):282-7.2008.*
11. *Al-Haddad NS, Al-Habeeb TA, Abdelgadir MH, Al-Ghamdy YS, Qureshi NA. Smoking pattern among primary health care attendees, Al-Qassim region, Saudi Arabia. East Mediterr Health J. 2003 Sep-Nov;9(5-6):911-22.*
12. *Siddiqui S, Ogbeide D. Profile of smoking amongst health staff in a primary care unit at a general hospital in Riyadh, Saudi Arabia. Saudi Med J 2001; 22:1101-04.*
13. *Jamal S Jarallaha, Khalid A Al-Rubeaanb, Abdul Rahman A Al-Nuaimb, Atallah A Al-Ruhailyb, Khalid A Kalantana. Prevalence and determinants of smoking in three regions of Saudi Arabia. Tob Control 1999; 8:53-56.*
14. *Almoutaz A Ahmed. Is it a proper referral form. MEJFM; 5(1):27-30. 2007.*
15. *Faiza A Qari and Daad Akbar. Diabetic foot: presentation and treatment. Saudi Med J; 21(5):443-446. 2000.*
16. *Al-Nuaim AR, Mirdas S, Al-Rubean K, Al-Mazrou Y, Al-Attas O, Al-Daghari N. Pattern and factors associated with glycemic control of Saudi diabetic patients. Ann Saudi Med; 18(2):109-12.1998.*
17. *Faiza A Qari. Glycemic control among diabetics at a university and Erfan private hospital. Pak J Med Sci; 21(4):408-412.2005.*
18. *AZAB Ahmad S. Glycemic control among diabetic patients. Saudi med J; 22, (5):407- 409. 2001.*
19. *Ahroni JH, Boyko EJ, Davignon DR et al. The health and functional status of veterans with diabetes. Diabetes Care 1994;17:318-21.*
20. *American diabetes association, American academy of neurology. Consensus on diabetic neuropathy. Diabetes care 1988; 11:592-7.*
21. *Shaw JE, Zimmet PZ. The epidemiology of diabetic neuropathy. Diabetes Rev.1999;7:245-52.*
22. *Kumar S, Ashe HA, Parnell LN et al. The prevalence of foot ulceration and its correlates in type 2 diabetic patients: A population-based study. Diabetic Med 1994; 11:485-4.*
23. *Neil HAW, Thompson AV, Thorogood M,et al. Diabetes in the elderly: The Oxford community diabetes study. Diabetic Med 1989;6:608-13.*
24. *JV Nielsen. Peripheral neuropathy,hypertension,f oot ulcers and amputations among Saudi Arabian patients with type 2 diabetes. Diabetes research and clinical practice;41(1):63-69.1998.*
25. *Abdulrahman Al-Tahan. The pattern of peripheral neuropathy in Saudi Arabia: the experience at King Khalid University Hospital 1983-1990.Saudi medical journal; 15(2):127-132.*
26. *Daad H Akbar. Diabetic neuropathy: discordance between symptoms and electrophysiological testing in Saudi diabetics. Bahrain Med Bull 2002; 24(1):10-12.*
27. *Abdulsalam A Al-Sulaiman, Hassan M Ismail,Ali I Al-Sultan. Electrophysiological findings in newly diagnosed Non-Insulin Dependent Diabetes: A prospective study. Ann Saudi Med; 17(4):399-401. 1997.*
28. *Al-Wakeel JS, Hammad D, Al Suwaida A, Mitwalli AH, Memon NA, Sulimani F. Microvascular and macrovascular complications in diabetic nephropathy patients referred to nephrology clinic. Saudi J Kidney Dis Transpl; 20(1):77- 85. 2009.*
29. *Akbar DH, Mira SA, Zawawi TH, Malibary HM. Subclinical diabetic neuropathy: a common complication in Saudi diabetics. Saudi med j; 21(5):433-7.*
30. *A. Moghtaderi, A. Bakhshipour, H. Rashidi. Validation of Michigan neuropathy screening instrument for diabetic peripheral neuropathy. Clinical Neurology and Neurosurgery; 108(5): 477-481.2006.*
31. *Qidwai SA, Khan MA, Hussain SR and Malik MS. Diabetic neuroarthropathy. Saudi Med J; 22(2):142-5. 2001.*
32. *Orchard TJ, Strandness DE: Assessment of peripheral vascular in diabetes.Report and recommendations of an international workshop. Circulation 88:819-28.1993.*
33. *The Diabetes Control and Complication trial research group: The effect of intensive treatment of diabetes on the development and program of long term complications in insulin-dependent diabetes mellitus. New Engl J Med 329:977-86.1993.*
34. *Murabito JM, D'Agostino RB, Silbershatz H. Wilson WF: Intermittent Claudication: a risk profile from the Wilson WF :intermittent claudication: a risk profile from the Framingham heart study. Circulation 96:44-49.1997.*
35. *Melton LJ III, Macken KM, Palumbo PJ, Elvback LR: Incidence and prevalence of clinical peripheral vascular disease in a population-based cohort of diabetic patients. Diabetes Care 13:650-54, 1980.*
36. *G Premalatha, S Shanthirani, R Deepa, J Markovitz and V Mohan. Prevalence and risk factors of peripheral vascular disease in a selected South Indian population: the Chennai Urban Population Study. Diabetes Care; 23(9): 1295 -1300. 2000.*
37. *Sultan O Al-Sheikh, Badr A Aljabri, Lubna A Al-Ansary, Laila A Al-Khayal, Musaad M Al-Salman and Mohammed A Al-Omran. Prevalence of and risk factors for peripheral arterial disease in Saudi Arabia:A pilot cross-sectional study. Saudi Med J; 28(3):412-414.2007.*
38. *Faiza A.Qari and Daad Akbar. Diabetic foot: Presentation and treatment.Saudi Med J; 21(5):443-446.2000.*
39. *Sulimani RA, Famuyiwa OO, Mekki MO. Pattern of diabetic foot lesions in Saudi Arabia:experience from King Khalid university hospital, Riyadh. Ann Saudi med;11(1):47-50.1991.*

40 AbdulRashid Surahio and Ashar Ahmad Khan. Amputations and diabetes mellitus:an institutional experience.J Surg Pak;13(3):124-7.2008.
41 Almoutaz Alkhier Ahmed. Epidemiolgy of diabetes in Gurayat province (unpublished).
42 Al-Wakeel JS, Hammad D. Al Suwaida A,Mitwalli AH, Memon NA and Ani F. Microvascualr and macrovascular compilictions in diabetic nephropathy patients referred to nephrology clinic. Saudi J Kidney Dis Transpl; 20(1): 77-85. 2009.
43 SA Mazzuca, NH Moorman, ML Wheeler, JA Norton, NS Fineberg, F Vinicor, SJ Cohen and CM Clark. The diabetes education study: a controlled trial of the effects of diabetes patient education. Diabetes Care; 9, (1) 1-10.1986.
44 Iftikar Uddin, Tahir J.Ahmed, AbdurRahman A. Kurkuman and Rahila Iftikar. Diabetes education: Its effects on glycemic control. Annals of Saudi Medicine; 21(2-1):120-122.2001.
45 Alkhaldi YM and Khan MY. Audit of a diabetic health education program at a larg primary health care center in Asir region. Saudi Med J; 21(9):838-42.2000.
46 Abdelmoneim I, Al-Homrany MA. Education in the management of diabetes at the primary health care level: is there a gender difference?. East Mediterr Health J;8(1):18-23 .2002.
47 Moharram MM and Farahat FM. Quality improvement of diabetes care using flow sheets in family health practice. Saudi Med J;29(1):98-101.2008.
48 Mohammed H. Al Doghether. Improving foot examination of diabetics in primary care. Saudi medical journal;24(9):1029-1030.2003.
49 Sameer Kh Zimmo. Prevalence of dermatologic foot diseases in Saudi Arabia. Journal of Pan-Arab League of Dermatologists; 18(2):9-13.2007.
50 Ramsey SD, Newton K, Blough D et al. Incidence outcomes and cost of foot ulcers in patients with diabetes. Diab Care; 22:382-87.1999
51 Muller IS, de Grauw WJC, van Gerwen WHEM et al. Foot Dutch primary health Care Diab Care;25:570-74.2002.
52 Afsaneh Alavi. Wound Care challenges faced in Iran. Advances in Skin and Wound Care; 20(1):27-28.
53 Qari FA. Profile of diabetic patients with end-stage renal failure requiring dialysis treatment at King Abdulaziz University Hospital, Jeddah. Saudi J Kidney Dis Transple;13(2):199-202.2002

A Warm Welcome to The International Independent Medical Index

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Most recently it has been announced that as from July 1, 2009, MEJFM, ME-JAA, MEJN and ME-JIM abstracts will be indexed in the new IMI (International Independent Medical Index)[1]. As a member of the MEJFM and ME-JIM editorial boards I would like to warmly welcome this announcement. In what follows I will try to briefly point out why this announcement is hugely important.

Medical Journals prepare a platform for distribution of health and medical information. They do so to produce new knowledge, which by itself might transform into practice and policy[2-4]. However, in order to fulfill this aim thoroughly, indexing and abstracting services are needed.

Indexing and abstracting services by themselves prepare a platform for retrieval of literature published based on a specific set of standards such as topic, authorship, etc. They do so to help the users of information to have a better insight towards the topic, authorship, time and place of a published document[5].

Evidence suggests that prestigious indexing and abstracting services such as MEDLINE or ISI select more specialty English journals that are published in developed countries rather than more general non-English journals that are published in the developing world[6-9]. Unfortunately, this approach has generated at the very leas,t two interrelated important consequences as follows:

Firstly, those journals which are published in the developing world, despite their important roles, have become poorly visible and acknowledged by the international scientific community. Secondly, researchers within developing countries seek to publish their findings, even related to local problems, in journals which are published in the developed world.

Under such circumstances, the developing of an independent international indexing and abstracting services as IMI could partially alleviate these un-wanted side effects of existing prestigious indexing and abstracting services.

References

1. *Pocock, L. Note to authors and readers - Indexing of articles. Middle East J Family Med 2009; 7(4): 22.*
2. *Salager-Meyer F. Scientific publishing in developing countries: Challenges for the future. J Eng Acad Purposes. 2008; 7: 121- 132.*
3. *Shetty P. Comment: The developing world needs its own science journals. New Scientist. 2008, 20. 9.*
4. *Ofori-Adjei D, Antes G, Tharyan P, Slade E, Tamber PS. Have online international medical journals made local journals obsolete? PLoS Med. 2006; 3(8): e359. DOI: 10.1371/journal.pmed.0030359.*
5. *Al-Shorbaji N. Index medicus for the Eastern Mediterranean region. Emerg Themes Epidemiol. 2008; 5: 14.*
6. *Garfield E. The diverse roles of citation indexes in scientific research. Rev InveClin. 1998; 50(6):497-504.*
7. *Waheed AA. Scientists turn to journals in English. Scientific World Journal. 2001; 1:239-240.*
8. *Loria A, Arroyo P. Language and country preponderance trends in MEDLINE and its causes. J Med Libr Assoc. 2005; 93:381-385.*
9. *Fung ICh. Seek, and ye shall find: Accessing the global epidemiological literature in different languages. Emerg Themes Epidemiol. 2008; 5: 21.*

Can Diabetic Patients Fast During Ramadan?

ABSTRACT

Objectives: The objective of this study is to assess health difficulties facing diabetic patients in fasting during Ramadan, at a hospital based primary care clinic, Riyadh, Saudi Arabia.

Methods: This is a cross sectional study which was conducted at a hospital based primary care clinic at King Khalid University Hospital(KKUH), in Riyadh, Saudi Arabia. The study was conducted over a 5 month period started immediately after Ramadan 1427 (from 9th of Shawal 1427 to the end of Safar 1428) 31 October 2006 till 10 march 2007.

All adult male diabetic patients attending a one consultant primary care clinic at KKUH were interviewed during their routine follow up consultation by a consultant in family medicine. All included diabetic patients were interviewed once by the same consultant in family medicine. All diabetic patients were asked to determine how many days already they fasted during Ramadan 1427, any hypoglycemic attacks during Ramadan. They were also asked to categorize difficulties in fasting during Ramadan as: no difficulty, sometimes, and always. Patients were also asked did they adjust their diabetic medications and did they receive particular health education about adjusting their diabetic treatment during Ramadan. Data was analyzed using the statistical package for social science (SPSS) version 11.5.

Results: A total of 204 adult male diabetic patients were included in the study. Majority of patients were type 2 diabetes mellitus (97.1%), and (2.9%) were type 1 diabetes mellitus.

The result of this study show that the majority of diabetic patients in the study sample (92.2%) had fasted all days of Ramadan (30 days), while 4.4% fasted 29 days. This study showed that 93.6% of diabetic patients did not have any hypoglycemic attacks during Ramadan fasting. Only 3.9% of diabetic patients had one hypoglycemic attack, 1.5% had two attacks, 0.5% had three attacks, while 0.5% had six attacks. 83.3% emphasized that they had no health difficulty during Ramadan fasting, while 16.2 sometimes had health difficulties during Ramadan fasting. Most of the diabetic patients in this study, 91.6%, had been educated bytheir treating physicians about fasting in Ramadan, and 96.6% of diabetic patients had adjusted their oral hypoglycemic agents and insulin during Ramadan fasting.

Conclusion: The majority of type 2 Diabetic patients fasted during Ramadan without difficulties, and most had adjusted their oral hypoglycemic agents.
It is important and essential for primary health care physicians to educate their Muslim diabetic patients before Ramadan fasting, to clarify any misconception about adjustment of their hypoglycemic agents and insulin during Ramadan, and to avoid preventable complications like hypoglycemia which is sometimes fatal. Further community based studies are recommended to study diabetic patients' medical issues during Ramadan.

Key word: diabetes, Ramadan, fasting. Hypoglycemia, primary care.

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Introduction

During Ramadan, the ninth month of the Islamic lunar calendar, adult Muslims are required to abstain from taking any food, fluids, or oral drugs from dawn to sunset. Patients with chronic diseases often insist on fasting even though they are permitted not to by Islamic rules[1,2]. Serious complications of fasting from Ramadan have not been well documented in literature, but the most frequently reported is increased risk of hypoglycemia and hyperglycemia in patients with diabetes[3-12]. Despite evidence that many people with long term conditions modify their treatment regimens during Ramadan, many people do not get detailed advice on how to do this safely[2,4].

Sulphonylureas and insulin tended to increase the risk of hypoglycemia, whereas metformin was associated with less frequent hypoglycemia[13]. Patients with type 2 diabetes may safely fast with close monitoring of blood glucose levels and possible adjustment of medication to avoid hypoglycemia[3] Several studies have been published on the effects of fasting in healthy adults, but little is known on the clinical problems during the fast of Ramadan[1,6,9,12].

The objective of this study is to assess health difficulties facing diabetic patients in fasting during Ramadan at a hospital based primary care clinic, Riyadh, Saudi Arabia.

Methods

This is a cross sectional study which was conducted at a hospital based primary care clinic at King Khalid University Hospital(KKUH), in Riyadh, Saudi Arabia. The study was conducted over a 5 month period starting immediately after Ramadan 1427 (from 9th of Shawal 1427 to the end of Safar 1428) 31 October 2006 till 10 march 2007.

All adult male diabetic patients attending a one consultant primary care clinic at KKUH were interviewed during their routine follow up consultation by a consultant in family medicine. All included diabetic patients were interviewed once by the same consultant in family medicine. The clinic schedule was 3 half day clinical sessions/ week during the study period. All diabetic patients were asked to determine how many days already

they fasted during Ramadan 1427 and any hypoglycemic attacks during Ramadan. They were also asked to categorize difficulties in fasting during Ramadan as: no difficulty, sometimes, and always. Also patients were asked did they adjust their diabetic medications and did they receive particular health education about adjusting their diabetic treatment during Ramadan.

Also other relevant data such as age, type of DM, duration of DM, type of treatment, and glycosylated haemoglobin HBA1C were recorded in a specific data collection form. Data was analyzed using the statistical package for social science (SPSS) version 11.5.

Results

A total of 204 adult male diabetic patients were included in the study. The majority of patients had type 2 diabetes mellitus (97.1%), and (2.9%) had type 1 diabetes mellitus. (Table 1)

The result of this study shows that the majority of diabetic patients in the study sample (92.2%) had fasted all days of Ramadan (30 days), while 4.4% fasted 29 days. (Table 2).

This study showed that 93.6% of diabetic patients did not have any hypoglycemic attacks during Ramadan fasting. Only 3.9% of diabetic patients had one hypoglycemic attack, 1.5% had two attacks, 0.5% had three attacks, while 0.5% had six attacks. (Table 3)

83.3% emphasized that they had no health difficulties during Ramadan fasting. While 16.2 sometimes had health difficulties during Ramadan fasting (Table 4). Most diabetic patients in this study, 91.6%, had been educated by their treating physicians about fasting in Ramadan and 96.6% of diabetic patients had adjusted their oral hypoglycemic agents and insulin during Ramadan fasting (Table 5).

Discussion

Medicine is a theoretical and practical science which shari'a (Muslim law) has permitted to be learned and practiced because of its ability to preserve health and ward off maladies and disease from this honored human body[14].

Ramadan fasting is a healthy method for improving coronary heart disease risk factors, since many factors can influence the effects of Ramadan on biochemical and physiologic parameters[9]. Iatrogenic hypoglycemia is the limiting factor in glycemic management of diabetes. It causes recurrent symptomatic and sometimes, at least temporarily, disabling episodes in most people with type 1 diabetes as well as in many with advanced type 2 diabetes, and is sometimes fatal[15]. No study has so far been able to link Ramadan fasting with hypoglycemia in healthy individuals[9]. The results of this study show that the majority of diabetic patients in the study sample (92.2%) had fasted all days of Ramadan (30 days), while 4.4% fasted 29 days. Only one elderly diabetic patient did not fast during all days of Ramadan because of health difficulties he was facing due to advanced type 2 diabetes and co morbidities of advanced unstable cardiac diseases and on multi medications.

Most of the Muslim diabetic patients followed at the primary care clinic in this study were highly concerned and motivated to fast during Ramadan like other healthy people, even though sick people are excused in Islam[1]. This study showed that 93.6% of diabetic patients did not have any hypoglycemic attacks during Ramadan fasting. 83.3% emphasized that they had no health difficulties during Ramadan fasting, while 16.2 sometimes had health difficulties during Ramadan fasting. This might be explained because most of the diabetic patients in this study 91.6% had been educated by their treating physicians about fasting in Ramadan and 96.6% of diabetic patients had adjusted their oral hypoglycemic agents and insulin during Ramadan fasting, even though one study done in Saudi Arabia showed that the frequency of lack of knowledge of symptoms of hypoglycemia was around 50% of 1,039 diabetic subjects registered in urban and rural primary health care centers[16]. In this study 73% of diabetic patients were on oral hypoglycemic agents, while 23.5% were on insulin, and 3.4% were on diet only. The current study showed that only 36.3% of diabetic patients had glycosylated haemoglobin HBA1C less than 7 which indicates the need for further blood sugar control in diabetic patients to improve the quality of diabetic care and to prevent complications. Other studies showed poor glycemic control in 77% of the diabetic patients by HBA1C level[17].

This study showed that most of the diabetic patients had other cardiovascular risk factors, as 44.1% of them had diabetes and hypertension, and 19.1% had diabetes and dyslipedemia, while only 33.3% of them had only diabetes mellitus. Two studies showed that the effects of fasting during Ramadan on stable patients with cardiac disease are minimal. The majority of patients with stable cardiac disease can fast during Ramadan without significant detrimental effects[6,7].

One study done in Saudi Arabia showed that the rate of treatment-related misconceptions among primary health care centers registered diabetic patients to be high, and of an important nature. It stresses the need for constant motivation and face to face health education at frequent intervals to encourage better knowledge regarding the disease and to improve compliance with treatment[18].

Also different studies emphasized the importance of continuing patient and family education for care of diabetes[19-21]. and to improve the quality of diabetic care and prevent diabetic complications[22-27].

Diabetes is known to be associated with alterations in metabolic parameters. Muslim type 2 DM patients showed a trend towards better glycemic control following Ramadan fasting[28].

In conclusion, the majority of type 2 Diabetic patients fasted during Ramadan without difficulties and most had adjusted their oral hypoglycemic agents.

It is important and essential for primary health care physicians

to educate their Muslim diabetic patients before Ramadan fasting, to clarify any misconception about adjustment of their hypoglycemic agents and insulin during Ramadan, and to avoid preventable complications like hypoglycemia which is sometimes fatal. Further community based studies are recommended to study diabetic patients' medical issues during Ramadan.

References

1. *Aziz F. Research in Islamic fasting and health. Ann of Saudi Med 2002;22(3-4):186-191*
2. *Aadil N, Houti I, Moussamih S. Drug intake during Ramadan.BMJ 2004;329:778-782.*
3. *Crosby S, Rourke E, Warfa M. Fasting and Medical Issues during Ramadan. JAMA 2005;294(13):1618-1619.*
4. *Sheikh A. Should muslims have faith based health services. BMJ 2007;334:74-75.*
5. *Khalid B, Bendahmane M, Belbraouet S. Ramadan fasting induces modifications of certain serum components in obese women with type 2 diabetes. Saudi Med J 2006;27(1):23-26*
6. *Chamsi- Pasha H, Ahmed W. The effect of fasting in Ramadan on patients with heart disease. Saudi Med J 2004;25(1):47-51.*
7. *Al Suwaidi J, Zubaid M, AL-Mahmeed W, Al-Rashdan I, Amin H, Bener A, etal. Impact of fasting in Ramadan in patients with cardiac disease. Saudi Med J 2005;26(10):1579-1583.*
8. *Kiziltan G, Karabudak E, Tuncay G, Avsar F, Tuncay P, Mungan O, etal. Dietary intake and nutritional status of Turkish pregnant women during Ramadan. Saudi med j 2005;26(11):1782-87.*
9. *Fakhrzadeh H, Larijani B, Sanjari M, Baradar-Jalili R, Amini M. Effect of Ramadan fasting on clinical and biochemical parameters in healthy adults. Ann Saudi Med 2003;23:223-226.*
10. *Qujeq D, Bijani K, Kalavi K, Mohiti J, Aliakbarpour H. Effects of Ramadan fasting on serum low-density and high-density lipoprotein cholesterol concentrations. Ann Saudi Med 2002;22(5-6):297-299.*
11. *Kassab S, Abdul-Ghaffar T, Nagalla S, Sachdeva U. Interactions between leptin, neuropeptide-Y and insulin with chronic diurnal fasting during Ramadan. Ann Saudi Med 2004;24(5):345-349.*
12. *Sarraf-Zadegan N, Atashi M, Naderi G, Baghai A, Asgary S, Fatehifar M, etal. The effect of fasting in Ramadan on the values and interrelations between biochemical, coagulation and hematological factors. Ann Saudi Med 2000;20(5-6):377-381.*
13. *Holman R, Cull C, Fox C, Turner R. United kingdom prospective diabetes study (UKPDS) 13: relative efficacy of randomly allocated diet, sulphonylurea, insulin, or metformin in patients with newly diagnosed non insulin dependent diabetes followed for three years. BMJ 1995; 310:83-88.*
14. *Ajlouni K. Values, qualifications, ethics and legal standards in Arabic (Islamic) medicine. Saudi Med J 2003; 24(8):820-826.*
15. *Cryer P. Diverse causes of hypoglycemia- associated autonomic failure in diabetes. N Engl J Med 2004; 350: 2272-79.*
16. *Elzubier A. Knowledge of hypoglycemia by primary health care centers registered diabetic patients. Saudi Med J 2001;22(3):219-222.*
17. *Al- Ghamdi A. Role of HBA1C in management of diabetes mellitus. Saudi Med J 2004;25(3):342-345.*
18. *Al- Saeedi M, Elzubier A, Bahnassy A, Al-Dawood K. Treatment- related misconceptions among diabetic patients in western Saudi Arabia. Saudi Med J 2002;23(10):1243-46.*
19. *Habib S, Aslam M. Risk factors, knowledge and health status in diabetic patients. Saudi Med J. 2003;24(11):1219-24.*
20. *Azab A. Glycemic control among diabetic patients. Saudi Med J 2001;22(5):407-409.*
21. *Al-Rowais N. Herbal medicine in the treatment of diabetes mellitus. Saudi Med J 2002;23(11):1327-31.*
22. *Ruggenenti P, Fassi A, Ilieva A, Bruno S, Petrov iliev I, Brusegan V, etal. Preventing micro-albuminuria in type 2 Diabetes.N Engl J Med 2004;351:1941-51.*
23. *Akbar D. Sub- optimal postprandial blood glucose level in diabetics attending the outpatient clinic of a university hospital. Saudi Med J 2003;24(10):1109-12.*
24. *Ritz E, Orth S. Nephropathy in patients with type 2 Diabetes Mellitus. N Engl J Med 1999;341:1127-33.*
25. *Gress T, Nieto J, Shahar E, Wofford M, Brancati F. Hypertension and Antihypertensive therapy as risk factors for Type 2 Diabetes Mellitus. N Engl J Med 2000;342:905-12.*
26. *Davidson M, Schriger D, Peters A, Lorber B. Relationship between fasting plasma glucose and Glycosylated Hemoglobin. JAMA 1999;281:1203-10.*
27. *Akbar D, Al- Ghamdi A. Is hypertension well controlled in hypertensive diabetics. Saudi Med J 2003;24(4):356-60.*
28. *Khatib F, Shafagoj Y. Metabolic alterations as a result of Ramadan fasting in non- insulin- dependent diabetes mellitus patients in relation to food intake. Saudi Med J 2004;25(12):1858-63.*

Table (1): Characteristics of diabetic patients attending a primary care clinic.

Characteristics of patients	Frequency	(%)
Age group (years)		
18-24	3	(1.5)
25-39	12	(5.9)
40-59	81	(39.7)
60 and above	108	(52.9)
Type of DM		
Type 1	6	(2.9)
Type 2	198	(97.1)
Duration of DM (years)		
< 5	74	(36.3)
5-9	44	(21.6)
10-14	63	(30.9)
15 and above	23	(11.3)
Type of treatment		
Diet only	7	(3.4)
Oral hypoglycemic agents	149	(73)
Insulin	48	(23.5)
Co morbidities		
Only DM	68	(33.3)
DM and HTN	90	(44.1)
DM and dyslipedemia	39	(19.1)
DM and renal disease	7	(3.4)
Glycosylated haemoglobin HBA1C		
< 7	74	(36.3)
7-8.99	67	(32.8)
9-10.99	32	(15.7)
11 and above	7	(3.4)
Not done	24	(11.8)
Total	204	100

Table (2): Days of fasting during Ramadan 1427

Days of fasting	Frequency	(%)
30 days (all Ramadan)	188	(92.2)
29	9	(4.4)
28	2	(1)
27	2	(1)
24	1	(0.5)
15	1	(0.5)
Not fast	1	(0.5)
Total	204	100

Table (3): Number of hypoglycemia attacks

Number of hypoglycemia attacks	Frequency	(%)
No hypoglycemia	191	(93.6)
One attacks	8	(3.9)
Two attacks	3	(1.5)
Three attacks	1	(0.5)
Six attacks	1	(0.5)
Total	204	100

Table (4): Patient opinion about difficulties faced in fasting during Ramadan

Difficulty grade	Frequency	(%)
No difficulty	170	(83.3)
Sometimes	33	(16.2)
Always	1	(0.5)
Total	204	100

Table (5): Patient educated about treatment and drug adjustments during Ramadan

Drug adjusted and patient educated	Frequency	(%)
Drug adjusted		
Yes	196	(96.6)
No	7	(3.4)
Patient educated		
Yes	186	(91.6)
No	17	(8.4)

Call for Papers from the South Asia Region - A Move to Expand the Journal to Meet the Needs of All Global Family Doctors

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The South Asia Journal of Family Medicine will become part of the MEJFM initially and we welcome this wider group of family doctors. While the region already contributes to the journal, we hope to provide a stronger focus on the wider region, which has much in common with the Middle East.

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