Brief Communication

Prevalence of dysglycemia and other cardiovascular risk factors among the rural population of Oman

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The prevalence of diabetes mellitus (DM) is increasing worldwide. In Sultanate of Oman 2 studies had been conducted in 1991 and 2000, which showed that the prevalence of DM were 10% and 12% respectively while that for impaired glucose tolerance (IGT) and impaired fasting glucose (IFG) were 11% and 7% respectively.[1,2] The objectives of the current study were to find out the prevalence of different patterns of dysglycemia namely DM, IGT, and IFG among adult rural Omani population and to find out the prevalence of other traditional cardiovascular risk factors namely age, family history of diabetes, obesity, arterial hypertension, dyslipidemia, cigarette smoking, and alcohol consumption. For this purposes, a health facility based cross sectional study was conducted between the years 2003 and 2004. Ethical approval had been taken from the Research and Ethical Committee, Ministry of Health, Oman.

A total of 1056 national citizens from a rural area (as Suwaiq wilayat), aged ≥20 years were randomly selected. Work up had included 1) Personal data namely age, gender, family and past history of diabetes, past history of hypertension and history of smoking and alcohol consumption. 2) Anthropometric measurements including weight, height, waist circumference, and blood pressure measurements. 3) Fasting plasma glucose (FPG), total cholesterol, and triglyceride, and 4) 75g-2h oral glucose tolerance test (OGTT) for all participants even those who reported previous diagnosis of DM unless they were on oral hypoglycemic drugs or insulin therapy. Plasma glucose, cholesterol and triglyceride were determined by the enzymatic methods. Dysglycemia and other cardiovascular risk factors were defined as follows: DM = FPG ≥7 mmol/l and/or 2-hour post glocuse (PG) ≥11.1 mmol/l, or known diabetic on hypoglycemic medication, IGT = 75g-2h glucose ≥7.8 <11.1 mmol/l, IFG = fasting plasma glucose ≥5.6 to <7mmol/l, hypertension = BP ≥140/90 mm Hg, overweight = body mass index (BMI) ≥25 to <30 kg/m^2, obesity = BMI ≥30 kg/m^2, central obesity was identified by a waist circumference of ≥94 cm for men and ≥80 cm for women, high serum cholesterol = ≥5.2 mmol/l, high serum triglyceride = ≥1.7 mmol/l, smokers = current smoker of one or more cigarettes on regular daily basis, and alcohol consumer = current intake of any amount of alcohol. Data from cross sectional survey was analyzed using the case-control approach analysis. The mean, standard deviation, odds ratio and the corresponding 95% CI were computed. Univariate and multivariate logistic regression analyses were performed to identify the risk factors for different patterns of dysglycemia. Significance of the obtained results was judged at the 5% level. All statistical analyses were performed with SPSS statistical software, version 14. Out of 1056 persons attended, only 879 completed the study resulting in an overall response rate of 83%. The majority of them were women (73.2%) and men constituted 26.8% of the sample. Participants' age ranged from 20 to 70 years.The mean age of women (42.43±9.54 years) was lower than that of men (50.32±10.33 years). The overall prevalence of diabetes was 18.9%. It was higher in men (23.3%) than in women (17.3%). Out of these subjects with diabetes, 29.5% submitted a past history of the disease and 70.5% were diagnosed during the survey. The prevalence of IGT was 13.3% and IFG was 5.7%. Family history of diabetes was reported in 14.7% of the surveyed population (**Table 1**). The prevalence of traditional cardiovascular risk factors was quite high. Half of the surveyed population was suffering from hypertension (50.1%) with a significantly higher prevalence in men (59.7%) than in women (46.5%). The survey identified 80.7% of cases of hypertension as only 19.3% reported a past history of the disease (**Table 1**). Half of the surveyed (men [50.8%] and women [50.1%]) had a high serum cholesterol level. A lower proportion of the population (19.3%) had a high triglyceride level, which was more encountered in men (22.9%) than in women (18.0%). More than half of the surveyed population was either overweight (32.3%) or obese (22.9%). Among women a high prevalence of obesity (28.0%) and central obesity was encountered (68.4%). In contrast, very few of the population were smokers and consumers of alcohol (**Table 1**). While age (≥40 years) was found to be a significant risk factor for all the patterns of dysglycemia (OR 3.70 for DM, 2.76 for IFG, and 1.99 for IGT), gender was not. Family history of diabetes was a risk factor for DM (OR 2.35), but not for IFG or IGT. Total adiposity was a risk factor for all the patterns of dysglycemia (OR 1.7 for IGT, 2 for DM, up to 4.5 for IFG) while central obesity was found to be risk factor for DM and IFG (OR 2.5 for both) but not IGT. Hypertension, hypercholesterolemia, and hypertriglyceridemia were all risk factors for DM (OR 2.25, 2.14, 3.83), while only hypertension was found to be risk factor for both IFG and IGT (OR 1.9 and 1.6) DM is independently predicted by being men, falling in older age groups, having a positive family of the disease, having high level of serum triglyceride, or having central obesity. Overweight and obesity as well as high serum triglyceride level independently predicted IFG. Impaired glucose tolerance is independently predicted

Table 1 - Prevalence of dysglycemia and related risk factors among the surveyed population.

Dysglycemia and related risk factors	Gender		Total (n=879) n (%)
	Men (n=236) n (%)	Women (n=643) n (%)	
Dysglycemia			
Non-diabetic	140 (59.3)	406 (63.1)	546 (62.1)
Impaired fasting glucose	7 (3.0)	43 (6.7)	50 (5.7)
Impaired glucose tolerance	34 (14.4)	83 (12.9)	117 (13.3)
Diabetic	55 (23.3)	111 (17.3)	166 (18.9)
Past history	14 (25.5)	35 (31.5)	49 (29.5)
Newly diagnosed	41 (74.5)	76 (68.5)	117 (70.5)
Family history of diabetes			
No	217 (91.9)	533 (82.9)	750 (85.3)
Yes	19 (8.1)	110 (17.1)	129 (14.7)
Hypertension state			
No	95 (40.3)	344 (53.5)	439 (49.9)
Yes	141 (59.7)	299 (46.5)	440 (50.1)
Past history	21 (14.9)	64 (21.4)	85 (19.3)
Newly diagnosed	120 (85.1)	235 (78.6)	355 (80.7)
Cholesterol			
Normal	116 (49.2)	321 (49.9)	437 (49.7)
High	120 (50.8)	322 (50.1)	442 (50.3)
Mean ± SD	5.24 ± 1.10	5.26 ± 1.12	5.26 ± 1.12
Minimum - maximum	2.59 - 8.17	2.59 - 8.87	2.59 - 8.87
Triglyceride			
Normal	182 (77.1)	527 (82.0)	709 (80.7)
High	54 (22.9)	116 (18.0)	170 (19.3)
Mean ± SD	1.33 ± 0.60	1.23 ± 0.618	1.26 ± 0.62
Minimum - maximum	0.20 – 4.10	0.10 – 5.09	0.10 – 5.09
Body mass index			
Normal	144 (61.0)	250 (38.9)	394 (44.8)
Overweight	71 (30.1)	213 (33.1)	284 (32.3)
Obese	21 (8.9)	180 (28.0)	201 (22.9)
Mean ± SD	24.42 ± 4.04	26.88 ± 5.73	26.23 ± 5.44
Minimum - maximum	16.01 - 38.88	10.88 - 49.04	10.88 - 49.04
Central obesity			
No	180 (76.3)	203 (31.6)	383 (43.6)
Yes	56 (23.7)	440 (68.4)	496 (56.4)
Smoking			
No	202 (85.6)	640 (99.5)	842 (95.8)
Yes	34 (14.4)	3 (0.5)	37 (4.2)
Alcohol			
No	234 (99.2)	643 (100.0)	877 (99.8)
Yes	2 (0.8)	0 (0.0)	2 (0.2)

by older age as well as overweight and obesity. So the current study had shown that the prevalence of DM had increased by approximately 80% compared in 1991 study[1] and 60% compared in 2000 study.[2] Similar figures were reported from the Arab gulf states, that indicated prevalence of DM of 25% in United Arab Emirates (2005),[3] and Saudi Arabia (2004).[4] Arab American had shown a comparable high figures for DM of 16% in men and 20% in women.[5] Among non-Arabs, DM prevalence showed much lower figures down to 10% in Americans[6] and European.[7] The high prevalence of DM in Arab Gulf Arab States may be attributed to the combined effects of ethnicity, rapid urbanization, and demographic and socio-economic changes. The current survey revealed a high prevalence of the other cardiovascular risk factors among Omani population, which were comparable with those reported by the 2000 Oman National Health Survey.[2] The traditional

cardiovascular risk factors had shown very high rates in other Arab Gulf states. Fifty percent of Saudis and Bahraini adult men were either overweight or obese. These rates approach 90% among Bahrainis women. Between 20-30% of Bahrainis were smokers and 50% of Emirate citizens had hypercholesterolemia. Nearly three-quarter of Emirate and Qatari citizens were either overweight or obese and one third of Qatari people were hypertensive.[8] Population in this area is leading a sedentary life as more time is spent on watching television than on physical activity. The dietary pattern is characterized by very low consumption of vegetables (5%) and fruits (12%). This survey demonstrated a considerably high prevalence of type 2 DM among rural population of Oman and an alarming rising trend of the disease. The situation is even worse with the high proportion of undiagnosed cases. The health situation of the population is further aggravated with the much higher prevalence of hypertension and hypercholesterolemia. With the high rates of overweight, obesity, and central obesity especially among women, it is expected to have an increasing incidence of diabetes and possibly cardiovascular diseases. Currently, half of the adult Omani population is at a significant risk for cardiovascular diseases, a situation that calls for concerted and organized efforts for effective preventive strategies at the primary, secondary and tertiary levels. This survey identified population at risk of dysglycemic that should be considered by programs for primary prevention. Screening program for the early identification of dysglycemia states including diabetes mellitus is a cost effective intervention considering that the early identification of diabetic patients and bringing them into care will minimize the disabling complications of the disease.

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Neonatal screening of glucose-6-phosphate dehydrogenase deficiency in Khorfakkan, United Arab Emirates

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The United Arab Emirates (UAE) society is cosmopolitan, but the indigenous inhabitants are traditional with puritanical values despite their exposure to other vastly different cultures and habits. Marriages between consanguineous couples are still the norm rather than the exception. As a result, there is a high frequency of genetic disorders.[1] One of these is glucose-6-phosphate dehydrogenase (G6PD) deficiency. Sukumar[2] first reported G6PD deficiency, which is the most common enzymopathy in humans,[3] in 1961. The G6PD is a cytoplasmic enzyme in the hexose monophosphate pathway responsible for the production of glutathione. It helps to protect the red blood cells from oxidative damage.[4] The G6PD deficiency is a common x-linked recessive genetic disorder affecting: one in 50 Southeast Asians, one in 10 Mediterranean families (Italian, Greek, and Middle Eastern), and one in 10 African-American.[4] The G6PD deficiency is the most common enzyme deficiency in the world, with approximately 400 million people living with it. It is most prevalent in people of African, Mediterranean, and Asian ancestry. The incidence in different populations varies from zero in South American Indians to less than 0.1% of Northern Europeans to approximately 50% of Kurdish males. In the United States, it is most common among African American males, approximately 11-14% are G6PD-deficient.[3]

Many studies indicate that G6PD deficiency is common in the Gulf region, Saudi Arabia, Bahrain, Kuwait, United Arab Emirates, Oman, and Qatar. This disease is also common in the other Arab countries such as Egypt, Iraq, Syria, Jordan, Palestine, and Lebanon.[4] Because of the high gene frequency in some regions, homozygous affected females are not uncommon. Females may also be affected through Lyonization or if they have Turner's syndrome.[3] There are 3 major clinical disorders: 1. Neonatal hyperbilirubinemia, 2. Chronic hemolytic anemia, 3. Induced hemolytic anemia; a. naphthalene (mothballs), b. sulphonamides, c. nitrofurans, d. aspirin, e. fava (broad) beans, f. viral infection. Newborn infants with immature and deficient enzyme pathways are at greater risk of developing hemolytic anemia than adults. However, neonates usually present with jaundice in the absence of anemia. Jaundice can be severe and result in kernicterus.[3] The prevalence of neonatal hyperbilirubinemia is twice that of the general population in males, who carry the defective gene and in homozygous females. It rarely occurs in heterozygous females.[2] The objective of the study is to evaluate the prevalence of G6PD deficiency in Khorfakkan and to compare it with the previous studies in Gulf countries.

Cord blood samples of all neonates born between 27th September 2006 and 28th March 2007, was screened for G6PD deficiency by fluorescent spot test ("United Diagnostics Industry," Kingdom of Saudi Arabia) using one ml of whole blood collected in the ethylenediamine tetraacetic acid tube. Red blood cell indices were studied for all the samples at the Khorfakkan Hospital, which is a 106 bed hospital and the only hospital in the city where almost all deliveries take place, and approximately 707 neonates are delivered each year, situated in the east coast region, Sharjah, UAE.

During this 6 month period, cord blood samples were collected from 275 patients samples (132 males and 143 females) with a ratio of 0.92:1, UAE citizen comprised was 218 patient samples, and non UAE comprised 57 patients samples with a ratio of 3.82:1. Out of the examined blood cord samples, 21 patient samples were clotted and excluded from the study leaving 254 patient samples. Out of the remaining samples, 123 (48.4%) samples were from male neonates, and 131 (51.6%) samples were from female neonates giving a ratio of 0.94:1. Two hundred and two (79.5%) patients were UAE citizens and 52 (20.5%) patients were non-UAE giving a ratio of 3.88:1. Out of the 254 cord blood samples, there were 20 patient samples positive for G6PD deficiency (13 male neonates and 7 female neonates) and the prevalence was estimated to be 7.9%. The gender-specific prevalence for male neonates was 5.1% and for female neonates was 2.8% giving a ratio of 1.86:1. The nationality specific prevalence for UAE citizens was 7.5% and for non-UAE citizen was 0.4%.

Analysis of the available data showed that out of the 254 neonates screened, 20 (7.9%) neonates had evidence of G6PD deficiency, which is higher than that found in many other Arabian countries, such as Egypt (1%), Lebanon (1% males, 2.1%-total), Syria (2.9%), Jordan (3.6%), Kuwait (5.5%), and Saudi Arabia (Yanbu) (3.1% male neonates, 0.9% female neonates).[3] Also, it is higher that found in other neighboring countries, such as Iran (Tehran) (3.6% male neonates and 0.6% female neonates), Turkey (6.9%), Tajikistan (2.1%), India (1.2% in South India, 2.8% male neonate and 1.1% female neonate), and other Asian countries such as Hong Kong and Macao (4.5% male neonates, 0.3% female neonates), Malaysia (5.1% male neonates, 1.3% female neonates by fluorescent test), China (4.2% total, 5.2% male neonate), and Philippines (3.9% males).[3] In comparison with the studies conducted in some of the western countries such as Italy (3.9% males), France (Marseille 2.1%) (Paris 6% male neonates and 1% female neonates), Spain (2.3%), Greece (3.17% semi-quantitative test, 5.5% quantitative test), and Croatia (6% Vis Island, 0.8% Dalmatia), our result is much higher.[3]

In our results, the percentage is lower than the other gulf countries such as Saudi Arabia (Qatif - 37% male neonates, 21.3% female neonates), Oman (27% male children <5 years, 11% female children <5 years), Bahrain (18% males, 10% females),[5] and Iraq (Basra 12.5%, 12.4% male and 8.8% female). Also, in the African and Asian countries such as Comoro (9.5%), Iran (11.6%), India (15% North, 27% West), and Thailand (11.1% male neonates, 5.6% female neonates).[3] The explanation may depend on racial differences in addition to the prevalence of other hemoglobinopathies rather than geographical distribution. We see that there is variation in the prevalence of G6PD deficiency in various districts in the same country such as Iran, India, and Saudi Arabia.[4] In Comoro, the prevalence of G6PD deficiency varies also from area to area as it is higher in areas where the origin of the people is mostly from the Arab Gulf, particularly from Shiraz region as from the 16 century onwards, most immigrants arrived. Both East Africa and The Arabian Gulf areas are endemic for hemoglobinopathies and G6PD deficiency, but with different underlying molecular defects and different gene frequencies.[3] The prevalence of G6PD among neonates in Khorfakkan is considerably high, especially among females and there is a requirement to include

the G6PD assay within the national neonatal screening and further quantitative study and enzymatic assay is indicated in the near future.

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A comparative study of the etiology of adult mandibular fractures in the Sultanate of Oman and South Australia

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Mandibular fractures are common injuries in adults with a range of causes. The main causes are road traffic accidents (RTA), interpersonal violence (IPV), falls, sporting, and industrial accidents. The relative incidence of these differing causes varies widely between different countries, and is a simple measure of societal issues occurring in a country. Road traffic accidents are a major health hazard in the developing countries, with the Middle East having one of the highest mortality rates in the world.[1] As per the World Health Organization reports, the road traffic injury mortality rates (per 100,000 population) in the Middle East region ranges between 19 and 26.[1] This has high economic and family impact with the costly RTA being estimated at 6 billion US dollars in the Middle East per year.[1] Death from RTA is the third leading cause for adults in the Middle Eastern region. In comparison, the mortality rate for RTA in the western world had declined markedly over the last 3 decades. For example, the RTA index (deaths per 10000 population) for Australia was 31 in 1970, and dropped to 8 in 2005, despite the increase in population.[2] This has not occurred spontaneously, but is a result of multiple government sponsored initiatives: fitting and use of seatbelts and child restrains, improved road infrastructures, reducing drunk drivers driving (for example, unrestricted random, and mobile breath testing), vehicle safety enhancements, improved speed enforcement, and delivery of targeted road safety education campaigns.

The other major cause of mandibular trauma is interpersonal violence, often exacerbated by the use of alcohol and drugs. As per the Australian Bureau of Statistics, 40% of men experience physical assault per year. Alcohol and drug use are known as a major cause of this increase in personal assault.[3] This too, can be reduced by governmental and personal initiatives. In a recent Australian study of a remote indigenous community, there was a high incidence of alcohol related domestic violence. The community, with the assistance of the state government, restricted alcohol to the area, and this resulted in a 70% reduction in facial injuries.[3] In addition, there are reports of decreased alcohol-related facial injuries in the Middle East countries, due to restricted religious beliefs. In this study, we compared the etiology, and type of mandibular fractures between the Sultanate of Oman and South Australia, with recommendations as to how government and social initiatives in Oman, can reduce the incidence of mandibular trauma.

The records of all mandibular fracture patients seen at the Oral and Maxillofacial Surgery Unit, Al-Nahdha and Khaula Hospitals, Oman, and at the Oral and Maxillofacial Surgery Unit, Royal Adelaide Hospital, South Australia in the period of 1st January 2004 to 31st December 2006 were analyzed. The data included age, gender, cause of injury, fracture sites, and treatment. The data were recorded on a standard database, and analyzed using a Microsoft Excel XP database sheet. Statistical analysis was performed using chi-square test to assess the significance of the differences on gender, age, etiology, and fracture type. A significance level of 0.05 was used. Ethical approval for the study was obtained from the Research Ethics Committee of the Royal Adelaide Hospital.

Two hundred and seventy-two patients were treated for mandibular fracture in Oman in the 3-year period. Two hundred and seventy-seven patients were treated by the Oral and Maxillofacial unit in South Australia

in the same period. Approximately 100 patients were treated for mandibular fracture in South Australia by other specialties, but their demographics and etiology were similar. The demographics are presented in **Table 1**. The study shows the main difference in the etiology of mandibular fractures in Oman, 53% are the result of RTA, and 7% are from assault, whereas in South Australia, 5% were from RTA, and 80% were from assault. These results are consistent with governmental reports on RTA from both countries. The RTA index, for example, deaths per 100,000 population for Oman is 27, while it is 9 for South Australia. These etiological differences are consistent with several world reports. There has been a remarkable increased incidence of RTA in developing countries. This is an indicator of societal and governmental differences.

The differing etiology is reflected in the different patterns of fracture. There are more multiple mandibular fractures in Oman (11%), compared to 3% for South Australia. With RTA, any site of the mandible can be involved, and this is demonstrated by relatively even distribution of fracture sites with slight predominance of condyles (36%). Physical violence has been associated with more mandibular angle fractures. This is also demonstrated in this report. Mandibular angle fractures dominated mandible fracture in the South Australian population (47%). The age and gender distribution on both centers are similar to several world reports. Men in the second and third decade of life, regardless of their cultural background, predominate in mandibular fractures. This may be contributed to the hyperactivity, independence, intolerance, and high-speed driving tendency among this group of the community. Preventive and behavioral changes programmes should target this group to reduce such injuries.

Table 1 - Demographics of adult mandibular fractures in Oman and in South Australia.

Demographics	Oman	South Australia	*P*-value
Gender (ratio)			0.8
Male	6.3	6.7	
Female	1	1	
Age (%)			0.6
15-19	9	10	
20-39	71	73	
40-82	15	12	
Etiology (%)			0.0001
RTA	53	5	
IPV	7	80	
Fall	18	7	
Sport	11	7	
Other	11	1	
Site (%)			-
Angle	21	46	
Condyle	36	28	
Symphysis	27	17	
Body	16	9	
Type (%)			0.001
Unilateral	49	47	
Bilateral	40	50	
Multiple	11	3	
Treatment (%)			
ORIF	52	69	
Closed treatment	48	31	

RTA - road traffic accidents (only 20% of patients were wearing seatbelts during accident), IPV - interpersonal violence, ORIF - open reduction and internal fixation

Treatment of mandibular fracture with open reduction and internal rigid fixation (ORIF) is a standard treatment modality in both countries[4] (**Table 1**). All mandibular fractures, except condyles are treated by ORIF. Closed treatment is the preferred choice for condylar fracture in Oman. In South Australia, both options are used for condylar fractures treatment. For this reason, as well as increased condylar fractures incidence in Oman, there are differences in percentages for the 2 treatments (**Table 1**).

Differences in RTA incidence can be contributed to 3 main reasons: transport and road systems, road safety regulations, and drivers compliance. There are multiple transport systems in South Australia, like buses, trains, O'Bans, and airplanes between cities. This reduces the load on the roads, and provide alternatives. Cars are the main transport resource for Oman. This is reflected too, by increased passengers' road injuries (50%), and road deaths in the Omani population (40%), compared to 26% of passenger injuries, and 26% of deaths in the South Australian population.

Australia has a long history of awareness on the importance of road safety. It was the first country to apply compulsory seatbelt wearing in the 1970's. There are multiple research centers for road and vehicle safety. These research centers contributed significantly to improved road safety measures, like, speed limits, child restraints, alcohol tests, airbags, and improvement of road infrastructures and systems. Road safety regulations in Australia are very comprehensive and strict. It applies a demerit point system, which can lead to cancellation of driving licence for a certain period of time, or it may lead to jail. This demerit points system is not applied in Oman. Driver compliance is an issue for the Oman government. There is low compliance reflected by: 1) 57% of RTA in Oman were due to neglect.[5] 2) almost half a million traffic offenses in 2005, approximately 47% was due to speeding.[5] 3) only 20% of the Omani patients were wearing seatbelts at the time of the accident (**Table 1**). This is compared to a rate of 87% of seatbelt wearing (during accidents) for South Australian drivers.[2]

Based on our comparative study and the above discussion, we propose the following recommendations:

1) provide multiple transport systems between cities and Gulf countries, to reduce road loads, and people's reliance on cars 2) legislate and enforce road safety measures and rules, like seatbelt compliance, speed restriction, and application of demerit points system 3) national multidisciplinary governmental preventive strategic plan that involves several Ministries of Health, Education, Media, Police, Transport, Higher Education, and religious affairs. All of these Ministries along with social initiatives, should work together on targeting and preventing causes of RTA, as well as implementing rules and measures to improve drivers' compliance 4) the Arab Gulf Cooperation Council (AGCC) Traffic Week plays an essential role in improving drivers' awareness in the region. However, improving awareness alone is not enough. Such campaigns should also consider targeting the problematic age group, and provide them with behavior management programs. Moreover, with the current severity of RTAs in the Gulf region, the AGCC Traffic week should be more than one week per year.

On the other hand, decreased incidence of personal violence in Oman may be contributed to restricted alcohol and drug use, due to social and religious reasons. Alcohol and drug abuse had contributed to the increased violence in developed countries. Prevention programs in developed countries should work on minimizing alcohol consumption.

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Morbidity pattern among males attending the primary care clinics at a University Hospital in Central Saudi Arabia

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Morbidity pattern in the community is best reflected through morbidity statistics derived from primary health care centers (PHCC) and it is a cornerstone in the process of health services planning. The frequency of patient visits to PHCC is affected by a range of factors including patient characteristics, physician/clinic factors, and broader issues such as access to services.[1] The family physician also influences patients' attendance rates through doctor-initiated visits. On top of those factors, differences in health care systems between countries may also affect patterns of patient visits.[2] Research on morbidity has shown variable patterns in different countries. In Tunisia, the respiratory problems took the first place on the list (39.6%) followed by circulatory disorders.[3] Morbidity pattern in primary health care has an important effect on referral rates to secondary care, but some referral can be avoided if adequate resources were available in the PHCC and communication between primary and secondary care improved.

Studies on morbidity patterns are basic for planning the training of health workers to suit the realities of medical practice.[3] This study was conducted to identify the morbidity pattern among adult male patients attending the primary care clinics (PCC) and the rate of referrals to secondary care. A cross-sectional study was conducted in the PCC at King Khalid University Hospital (KKUH), Riyadh, Kingdom of Saudi Arabia between August 2006 and May 2007. A random sample was selected from all adult male patients attending the PCC. No patients were excluded. A data collection form was designed to be completed by the physician, addressing the patient's age, reason of attendance, number of medications, and if patient was referred to secondary care. Physicians' agreement to participate in the study was taken before hand. King Khalid University Hospital is an 850 bed general hospital serving the Riyadh region. It also receives referrals form different regions of the Kingdom. Data analysis was performed with the Statistical Package for Social Science software version 11.5 and the results were presented as percentages.

One thousand two hundred and thirty-two male patients were recruited in the study, and less than half

were between 40 and 59 years of age (43%). The elderly comprised 36.5%, while 20.5% were less than 40 years. Diabetes was the most common health problem (45.8%) followed by hypertension and cardiovascular disorders (22.5%). There was no big difference in the percentages between other health problems (**Table 1**). Approximately 50% of the patients were receiving less than 5 medications and 16.6% were not on any treatment. Approximately 10% of the patients (n=130) were referred to other medical specialties and most (n=20) of them were referred to general surgery. The morbidity data presented in the present study relates to males only and despite this limitation it has addressed some important revelations related to the morbidity patterns in a primary care setting. It is known that most of the Saudi populations are young, but interestingly, in the current study elderly patients represented more than a third of the sample. There are 2 explanations either, the morbidity rate is more in the elderly age group, which is a well-known fact or because KKUH being a university hospital is considered a referral center so it does not represent the real morbidity in the community. This pattern is well known in the Western world, in which the elderly group is the majority and is well represented in the health care system.[4]

Table 1 - Percentages of different problems presented by the patients (N=1232).

Problems	n (%)
Diabetes mellitus	564 (45.8)
CVS (mainly hypertension)	277 (22.5)
Gastroenterological	61 (5)
Urological	54 (4.4)
Respiratory	53 (4.3)
Neurological	40 (3.2)
Musculoskeletal	35 (2.8)
Infection	23 (1.9)
Surgical	18 (1.5)
Endocrinological	17 (1.4)
ENT	8 (0.6)
Psychiatric	7 (0.6)
Dermatological	6 (0.5)
Renal	6 (0.5)
Nutritional	6 (0.5)
Hematological	5 (0.4)
Malignancy	2 (0.2)
Vascular	3 (0.2)
Eye	1 (0.1)
Non-specific	7 (0.6)
Refill medication	39 (3.2)

CVS - cardiovascular system, ENT - ear, nose, and throat

The high prevalence (23.7%) of diabetes in Saudi Arabia was also reported before,[5] however, the figure drawn from the current study (45.8%) is higher. The setting in which the study was conducted (KKUH) may play a role as also other environmental, dietary, and genetic factors may be responsible, such as the sedentary life style and high calorie diet. The increasing morbidity from cardiovascular disease is supported by the high prevalence (22.5%) of hypertension in our patients. Interestingly, psychiatric morbidity was low compared to other studies in the West.[1] The social structure of the community especially the close family ties may be a protective factor against psychiatric problems. We also noted the low prevalence of respiratory problems as compared to another study.[6] However, the emergency services are offered in the accident and emergency department, where most of the acute respiratory problems are seen rather than the PHCC, this may account for this low prevalence. Diabetic and hypertensive patients represented a higher morbidity and offering health care for such patients will no doubt increase the burden on health authorities and the health care system in general and of course its cost. This is best demonstrated by the number of medications consumed by our patients as approximately 50% of the patients were receiving 1-4 medications. Interestingly only 10.6% of the patients were referred to secondary care. This low rate of referral to secondary care may also be related to the availability of services in the private sector, which provides immediate services without the long waiting time for an appointment, as in the governmental sector.

The findings of the present study provide badly needed information on the morbidity pattern, drug treatment, and referral rates in primary care clinics, which may be reflected on the demand on secondary care. Such information may help in future planning of services delivered in primary care clinics. Further studies are needed that should include both males and females and to be conducted in more than one health care center so that a wide pattern of morbidity could be determined outside the university hospital setting.

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