

Performance evaluation of the BD phoenix automated microbiology system in meropenem susceptibility testing of clinical *Pseudomonas aeruginosa* isolates

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In the management of pseudomonal infections, carbapenems are among the most potent and the last-line of antibiotics. Therefore, reliable in vitro susceptibility testing of the clinical isolates of *Pseudomonas aeruginosa* (*P. aeruginosa*) against carbapenems is of paramount importance for the healthcare outcome.¹ However, in the post-market evaluations, it has been demonstrated that not all the testing systems produce universally accurate results for carbapenems.² There is a trend for the use of the new generation technology platforms to achieve a shorter turn around time in identification and susceptibility testing. The Phoenix Automated Microbiology System (AMS) (BD Diagnostic Systems, Sparks, MD) is a fully automated new technology platform for rapid identification (ID) and antimicrobial susceptibility testing (AST) of gram-positive and gram-negative bacteria.³ The aim of the present study was, to compare the performance of the routinely used standard disk diffusion method (SDM) and the BD Phoenix AMS (BD Diagnostic Systems, Sparks, MD) for the determination of meropenem susceptibility in the clinical isolates of *P. aeruginosa*.

The study was conducted on 142 non-repetitive clinical isolates of *P. aeruginosa*. The isolates were selected from a collection of isolates obtained from those patients admitted to the University Hospital Ondokuz Mayıs, between July and December 2003. For isolate selection, the criteria described in the Class II Special Controls Guidance Document for antimicrobial susceptibility test systems (FDA-CII/AST) published by the Food and Drug Administration (FDA) Office of In Vitro Diagnostic Device Evaluation and Safety⁴ have been modified. The modification was to adjust the ratio of meropenem susceptible, intermediate, and resistant isolates approximately to 42%, 9% and 49%, based on the AST results with the standard broth microdilution (SBM) method.

Organism identification and Phoenix AST. The strain definition for *P. aeruginosa* was as follows: oxidase positive, catalase positive, pigment

production, growth at 42°C. The isolates were identified with conventional tests and BD Phoenix AMS NMIC/ID-5 combination panel. The NMIC/ID-5 panels were inoculated and incubated according to the manufacturer's instructions.

Reference susceptibility testing method. SBM was selected as the reference method for this study. The broth microdilution method was undertaken precisely as described previously in the National Committee for Clinical Laboratory Standards (NCCLS) approved standard M7-A5 (www.nccls.org). Minimum inhibitory concentration (MIC) of $\leq 4 \mu\text{g/mL}$ was considered meropenem susceptible (S), MIC of $8 \mu\text{g/mL}$ for an isolate was considered meropenem intermediate (I), and MIC of $\geq 16 \mu\text{g/mL}$ was considered meropenem resistant (R).

Standard disk diffusion method. SDM was performed in accordance with the recommendations of the NCCLS document M2-A7 (www.nccls.org). Inhibition zone sizes of $\geq 16 \text{ mm}$, 14-15 mm, and $\leq 13 \text{ mm}$ were considered meropenem susceptible, intermediate, and resistant. The reference strain *P. aeruginosa* ATCC 27853 was included in each test as recommended by the NCCLS (M100-S11) (www.nccls.org).

Reproducibility. In order to determine the variability of the Phoenix AMS on repeat testing, 15 strains (including the NCCLS-recommended quality control strain) were tested in triplicate. The reference strain with the SBM meropenem MIC value between 0.25-1 $\mu\text{g/mL}$, one study isolates with the SBM meropenem MIC value of 0.5 $\mu\text{g/mL}$, and 13 study isolates with the SBM meropenem MIC values between 4-16 $\mu\text{g/mL}$ were tested. The MIC results for each strain-antimicrobial agent combination were used to determine a modal MIC result, and the frequency of MICs within plus or minus one dilution of this mode was determined and used as an expression of reproducibility.⁵ As the standard disk diffusion method is already a well-established routine test method widely, the reproducibility was not assessed. All tests results with very major discrepancy, major discrepancy, and minor discrepancy were repeated by the test methods and the broth microdilution reference method.^{2,5}

Data analysis. Data obtained from the experiments, have been processed according to the definitions in the FDA-CII/AST to be used in the comparative evaluation of results with the exception of essential agreement that is not possible to evaluate for the SDM by definition.⁴ Test method MIC and zone sizes were compared to SBM results by conversion

Table 1 - Performance metrics of the Phoenix AMS and the standard disk diffusion method as compared to the reference broth microdilution method.

Testing method	No. in interpretive category*			No. of results (%)			
	S	I	R	CA	VMD	MD	mD
Standard Broth Microdilution Method	60	12	70				
FDA criteria†				(>89.9)	(0.00) ‡	(≤ 3)	
Phoenix AMS							
Before DR**	62	10	70	138 (97.2)	2 (2.9)	0	2 (1.4)
After DR**	60	10	72	140 (98.6)	0	0	2 (1.4)
Standard							
Before DR**	60	3	79	133 (93.7)	0	0	9 (6.3)**
Disk Diffusion							
After DR**	60	3	79	133 (93.7)	0	0	9 (6.3)**

*S - susceptible; I - intermediate; R - resistant, CA - categorical agreement, †Acceptable performance metrics criteria according to the, ‡VMD - very major discrepancy, was acceptable if the rate was equal to 0.00 % as a function of the number of resistant organisms, MD - major discrepancy, mD - minor discrepancy, **DR - discrepancy resolution, FDA - Food and Drug Administration, AMS - Automated Microbiology System, **When those isolates with mD were tested with SBM, the results were concordant in 1-3 mm.

to category interpretations based on NCCLS guidelines (M100-S11) (www.nccls.org). Briefly, categorical agreement (CA) defined as agreement of interpretive results (SIR) between a new device under evaluation and a NCCLS standard reference method. A very major discrepancy (VMD) was detected when the NCCLS reference category result is R and the new device result is S. A major discrepancy (MD) was detected when the NCCLS reference category result is S and the new device result is R. The minor discrepancy (mD) was detected when the NCCLS reference category result is R or S, and the new device result is I and vice versa.⁴ Performance metrics of the laboratory automation system in terms of speed from “idle” to “idle” status were calculated as average time to ID and AST results using the BD Phoenix AMS and BD EpiCenter Computer System (BD Diagnostic Systems) databases. The agreement between the disk diffusion and the Phoenix AMS with SBM results was estimated by the kappa statistic.

In **Table 1**, it summarizes the evaluation results of the CA, VMD, MD, and mD rates of the Phoenix AMS and SDM compared to the NCCLS broth microdilution method as the reference method. The FDA-CII/AST has determined stringent criteria of performance that must be fulfilled to qualify an AST for routine use in the microbiology laboratory.⁴ It has been recommended that an overall CA rate of <10% should be achieved for accepting the performance of the susceptibility tests, with up to 3% and 1.5%, MD and VMD rates. Reproducibility should be ≥ 95% (± 1 dilution) agreement as compared to the mode. In the current study, within the limitations of discrepancy resolution, these criteria were met as Phoenix AMS and SDM achieved an overall CA of 97.2% (98.6 % in repeat tests) and 93.7%. The mD,

MD, and VMD rates for the isolates tested were 1.4%, 0%, and 2.9%, and 6.3%, 0%, and 0% for the Phoenix AMS and the SDM. Test results confirmed the reproducibility of the Phoenix AMS with a rate of 97.8%. The unacceptable rate of 2.9% for VMD in the Phoenix AMS was correctable in the discrepancy resolution. The corrections made by the discrepancy resolution as described earlier were the limitation of the study.^{2,5} There was excellent agreement between the SDM and the Phoenix AMS with SBM results for SIR categories (kappa, 0.884 and 0.975; $p < 0.001$ for both). When the MICs of Phoenix AMS were compared with that of SBM, there was a good agreement (kappa, 0.801, $p < 0.001$). For *P. aeruginosa* isolates, the mean ID/AST reporting time with the Phoenix AMS was 15.05 ± 1 hours (mean ± SD).

With regard to AST, it has been reported that the inoculation size is one of the most important variability faced in automated systems.³ In our study, the findings of VMD in 2 isolates with the Phoenix AMS were corrected in the discrepancy resolution tests. Despite our strict adherence to the recommendations by the manufacturer, it is possible that inoculum for these 2 isolates remained low, and thus, the VMD occurred. If this consideration is right, the results of this study may point out the importance of inoculum size as a possible determinant in the accuracy of results obtained with the Phoenix AMS when *P. aeruginosa* are tested. In a recent study by Steward et al,² carbapenems susceptibility of 114 *P. aeruginosa* isolates were studied by a variety of test systems, including the disk diffusion, the Microscan MIC system and the Vitek system, and were compared with the proposed NCCLS reference microdilution procedure. These comparisons discovered the following error rates: for disk diffusion, very-major

error 0%, major error 7.4%, and minor errors 18.4%; for Microscan MIC system, very major error 4.8%, major error 0%, and minor error 11.4%; and for the Vitek system, very major error 0%, major error 8.9%, and minor error 23.4%. In our study, we never identified such a high error rates.

Within the limitations of discrepancy resolution, the results of our study indicate that Phoenix AMS, and the SDM might be acceptable for use as a routine method for susceptibility testing of *P. aeruginosa* to meropenem. Although, further studies are clearly needed for the reliable detection of the meropenem resistance under routine laboratory conditions in *P. aeruginosa*, it can be concluded that the Phoenix AMS may provide a rapid and conveniently alternative to SDM.

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Effect of lime juice consumption on urine pH value

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Urinary calculi are the third most common affliction of the urinary tract, exceeded only by urinary tract infections and pathologic conditions of prostate.¹ The prevalence of this disease is estimated to be 2-3%, and generally, 50% of patients experience recurrent urinary stones within 5 years without prophylactic intervention.² Depending on the stone composition, several fluids have been found to be suitable like mineral water, orange juice, apple juice, and herbal teas in prevention and treatment.³ Kesler et al³ has found that blackcurrant juice can support the treatment of uric acid stone disease due to its alkalizing effect. Moreover, they showed that cranberry juice acidifies urine. Therefore, it is useful in treatment of brushite and struvite stones as well as urinary tract infection. Honow et al⁴ identified a significant increase in urine pH value after orange juice consumption. Little is known in regard to lime juice. It is available, inexpensive, and many people use it in their daily regime. The aim of this study was to evaluate the effect of lime juice consumption on urine pH value.

The study was performed as a clinical-trial on October 2004 in a 4-day period. Investigation was carried out using 14 males and 16 females, healthy individuals with the mean \pm SD age of 38.45 ± 10.07 (range 20-51). They had no history of urolithiasis or other renal disorder neither in them nor in their first-degree relatives. Also, they had no history of peptic ulcer and did not use any drug. All subjects received a standardized diet guideline, a form to record pH values in and pH strips from MADAUS Company. Each subject provided urine pH, 4 times a day (before breakfast, 2-hour after breakfast, at noon, and in the evening) using pH strips and recorded pH values in the form. They were required to consume lime juice from the second night with their dinner, and after that on the third and fourth days, 3 times a day with meal (in the morning, at noon, and at night). Each time they had to get 30 cc pure lime juice with a glass of water (250 cc) without any additives. The data of forms were analyzed using t-paired test at a significant level of $p < 0.05$. The mean of urine pH value after consumption was significantly higher than before consumption, either in general or in each of 4 times of checking pH, separately ($p < 0.001$) (Table 1). Mean \pm SD of urine pH was highest in the evening of fourth

Effect of lime juice consumption on urine pH value

Table 1 - Comparing the mean SD of urine pH values before and after lime juice consumption

Time	Mean SD \pm before consumption	Mean SD \pm after consumption	t-paired test
Before breakfast	5.7155 \pm 0.2913	6.2707 \pm 4021	<0.001
Two hours after breakfast	5.7293 \pm 0.3390	6.3517 \pm 0.4298	<0.001
Noon	5.9655 \pm 0.3687	6.3638 \pm 0.3667	<0.001
Evening	6.0379 \pm 0.3351	6.4431 \pm 0.3242	<0.001
Total	5.8621 \pm 0.2568	6.3573 \pm 2357	<0.001

day (6.486 \pm .441), and in the first morning was lower than other times (6.224 \pm .453). Comparing the third and fourth days of study, we had a higher pH value in the fourth day (the second day of consumption), however, this difference was not significant ($p=0.45$). For more investigation we compared urine pH values between females and males, and we did not find any significant difference.

The results of this study showed a significant increase in urine pH value after lime juice consumption. No significant difference was found between urine pH values in males and females. Furthermore, although the urine pH value in the fourth day of study was higher than the third day, it was not significant. Many studies have taken place to evaluate effects of different beverages on urine composition and parameters. Kessler et al³ evaluated the influence of blackcurrant-, cranberry-, and plum juice consumption on stone formation risk factors using 12 healthy male subjects. In their study, cranberry juice decreased the urine pH, whereas the excretion of oxalic acid was increased. The blackcurrant juice increased urinary pH and the excretion of citric and oxalic acid. Honow et al⁴ studied 9 healthy female subjects to evaluate the effect of grape fruit-, apple-, and orange juice on urinary variables; they showed a significant alkalinizing effect on urine pH for grapefruit but not for orange and apple juice. Lime, grapefruit, and orange are from citrus family of fruit, and contain a large amount of citric acid. So, it was expected that the effect of lime juice on urine pH is the same as their effect. Our study confirmed this same alkalinizing effect. Since the dissociation constant protein kinase A (PKA) of uric acid is 5.75 at this pH, one half of uric acid is ionized and soluble. As pH increases, most become soluble and 90% of uric acid is soluble at a pH of approximately 6.5. So, hydration and alkali are the cornerstones of treatment.¹⁻² As well as uric

acid stones, the major objective in the management of gouty diathesis is to increase the urine pH above 5.5, preferably to a level between 6 and 6.5.⁵ Due to these points, although the study was carried out on healthy subjects rather than in stone forming patients, the findings suggest that lime juice consumption can support treatment and prevention of uric acid and cystine stones, as well as management of gouty diathesis due to its alkalinizing effect.

We note that further research is needed to evaluate the effect of lime juice on other urinary parameters and so in stone forming patients. Also, more studies are needed to find the minimum effective dose of lime juice in prevention and treatment.

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Prevalence of metabolic syndrome in Oman using the International Diabetes Federation's Criteria

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Several epidemiological studies reported high prevalence of metabolic syndrome among Arab populations of the Middle East,^{1,2} and elsewhere.³ In Oman, the age-adjusted prevalence of metabolic syndrome among Omanis was shown to be 21% using the Adult Treatment Panel III (ATP III) criteria.⁴ However, in their pursuit to standardize the data reporting, the International Diabetes Federation (IDF) adopted a worldwide consensus definition of the metabolic syndrome.⁵ To determine the effect of the new definition on the prevalence of the metabolic syndrome in Oman, we reanalyzed data of a cross-sectional survey of the Nizwa Healthy Lifestyle Project. The survey was conducted in 2001 and contained a probability random sample of Omani adults aged ≥ 20 years living in the city of Nizwa (180 km south to the capital of Muscat). The overall response rate for the survey was 75.5%. After excluding pregnant women (n=72) and individuals with missing data on various components of the metabolic syndrome (n=20), 1,419 subjects' data were analyzed. Details of sampling methods, laboratory specimens collection, and analysis were given elsewhere.⁴ Intercooled Stata (version 7) was used to calculate prevalence rates, p-values and 95% confidence interval (CI)

for point estimates. To facilitate comparisons with other published rates, all prevalence rates were age-adjusted by direct method within 5-year age bands using the World Standard Population. We used the working definition provided by the IDF to estimate prevalence of the metabolic syndrome in Oman. According to the new IDF definition,⁵ for a person to be defined as having metabolic syndrome, he must have central obesity (defined as waist circumference ≥ 94 cm for men and ≥ 80 cm for women), plus any 2 of the following 4 factors: 1) Raised triglyceride levels ≥ 1.7 mmol/L, or specific treatment for this lipid abnormality. 2) Reduced high density lipoproteins cholesterol: < 1.03 mmol/L in men and < 1.29 mmol/L in women, or specific treatment for these lipid abnormalities. 3) Raised systolic blood pressure ≥ 130 or diastolic blood pressure ≥ 85 mm Hg, or treatment of previously diagnosed hypertension. 4) Raised fasting plasma glucose: (FPG) ≥ 5.6 mmol/L, or previously diagnosed type 2 diabetes. Due to lack of data on specific cut-points for waist circumference among Arabs, the cut-points for Europeans were used to classify individuals' central obesity status as recommended by the IDF.⁵ The overall crude prevalence of metabolic syndrome was 19.8% (95% CI, 17.7% to 21.9%) (Table 1). Among subjects aged 35-64 years, the crude prevalence was 29.3% (95% CI, 26.2% to 32.4%). Age-adjustment did not change prevalence rates among the subset population and among both genders. The age-adjusted prevalence among females (40.0%, 95% CI, 35.6% to 44.3%) was more than twice the rate among males (18.4%, 95% CI, 14.5% to 22.3%), (p-value for the gender difference

Table 1 - Prevalence of various components of the metabolic syndrome by gender among Omanis aged ≥ 20 years, The Healthy Lifestyle Project, Nizwa, 2001.

Factor	Males (n=695)		95% CI	Females (n=724)		95% CI	Total (n=1419)		95% CI
	n	(%)		n	(%)		n	(%)	
Central obesity [†]	112	(16.1)	13.4 - 9.1	439	(60.6)	57.0 - 64.2	551	(38.8)	36.3 - 41.4
Hypertriglyceridemia*	171	(24.6)	21.4 - 28.0	94	(13.0)	10.6 - 15.6	265	(18.7)	16.7 - 20.8
Low HDL	528	(76.0)	72.6 - 79.1	519	(71.7)	68.3 - 74.9	1,047	(73.8)	71.4 - 76.0
Hypertension*	173	(24.9)	21.7 - 28.3	100	(13.8)	11.4 - 16.5	273	(19.2)	17.2 - 21.4
Hyperglycemia*	298	(42.9)	39.2 - 46.6	220	(30.4)	27.0 - 33.9	518	(36.5)	34.0 - 39.1
Metabolic syndrome [†]	86	(12.4)	10.0 - 15.1	195	(26.9)	23.7 - 30.3	281	(19.8)	17.7 - 22.0

*p<0.05, †p<0.001, Chi-square for gender differences

<0.001). The table also shows the prevalence rate of each component of the metabolic syndrome by gender. Abdominal obesity was markedly higher in females than males. Over 88% of the population had one or more component of the syndrome, 56.5% had 2 or more, 27% had 3 or more, 11.7% had 4 or more, and only 3% had all 5 components of the syndrome. Thus, using IDF criteria would result in nearly one third of Omanis aged 35-64 years being diagnosed with metabolic syndrome compared to one fifth, using the ATP III criteria. The high prevalence of the syndrome could be attributed to the more stringent cut-points for waist circumference (particularly for women) and hyperglycemia, which are the second and third most common abnormalities in our population. The prevalence in Oman appears to be moderately high compared to Arabs of Saudi Arabia² (39.3%) and Tunisia¹ (45.5%) possibly due to inclusion of older subjects in both studies. The high prevalence of the metabolic syndrome has a significant public health implication in Oman and other developing countries. It will invariably pose a great challenge to the existing health system in terms of provision of screening and treatment services for various traits of this syndrome.

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Level of knowledge in diabetes medical care and disease complication among Saudi diabetics

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Diabetes is a complex disorder associated with several potentially preventable disabilities, such as, blindness, amputation, neuropathy, nephropathy, and cardiovascular diseases. The morbidity and premature mortality impose a sizable burden on individuals with diabetes and on society, signifying a major public health concern.¹ The World Health Organization (WHO) estimates the global diabetes population will grow to more than 200 million in 2010 and 330 million in 2025, with developing countries bearing the brunt of this epidemic in the 21st century.² According to the recent estimates, 4 million (23.7%) Saudi populations are already suffering from diabetes.³ Unfortunately, many sufferers become aware of this, only when they develop one of its life threatening complications. Efforts are being made to minimize complications of diabetes by increasing knowledge leading to positive behavior to combat the disease's ill effects on quality of life.⁴ There are very little data on the level of awareness concerning diabetes in developing countries like Saudi Arabia. Such data are extremely important to plan the public health policies with specific reference to implementation of national diabetes control programs. A literature search on knowledge regarding diabetes in developing countries actually yielded very few studies dealing with the awareness of diabetes among people with the disease and virtually no data on a whole population. Even in other developing countries, such studies have mainly focused on diabetic patients and are mostly clinic based, which introduces referral bias. Knowledge regarding awareness of diabetes in a population is the first step in formulating a prevention program for diabetes. This study is a step in this direction where the awareness and knowledge of diabetes in Saudi Arabia were assessed in a population-based study.

All diabetic patients attended the diabetic exhibition held in the main city center of Al-Khobar were in the study. Patients' aged <20 (more dependent on their parents) and >70 years (subjected to senile dementia) were excluded. Only pregnant women who had diabetes (gestational diabetes) were also excluded. Respondents were considered to have diabetes if they answered (yes) to the core question "Has a doctor ever told you that you have a diabetes". A control

group was selected from the public who attended the exhibition matched by age and sex. A pre-designed questionnaire was used for patients and controls. Only completed questionnaires (389 for cases and 704 for controls) were included in the study. The study found out that 3 quarters of the diabetics (74.6%) could define the disease correctly compared to almost one half of the control group (53.3%). The same finding was almost observed when the studied sample were asked whether they knew that diabetics need a special diet, where approximately 77.1% of the diabetics gave correct answer compared to only 54.5% of the

control group. However, the percentage was reduced when they were asked to give examples of the dietary products for diabetics available in the market, where less than half of the diabetics (48.1%) and one third of the control group (33.4%) could give correct answer and identify some of the products. Nearly two thirds of the patients (62.5%) and one half of the public (50.9%) knew that diabetes is a disease that may cause many complications in the human body, but only 45.8% and 37.4% of both groups, had a correct knowledge on diabetic foot and its complications (**Table 1**). A lesser percentage of both groups (38.8% and 30.8%) could

Table 1 - Level of knowledge in disease complication among Saudi diabetics.

Level of knowledge	Diabetics		Non -Diabetics	
	No	(%)	No	(%)
Knowledge of the disease				
Correct answer	290	(74.6)	375	(53.3)
Wrong answer	99	(25.4)	329	(46.7)
Total	389	(100.0)	704	(100.0)
X ² = 47.64 P=0.000				
Knowledge on special diet for diabetics				
Correct answer	300	(77.1)	384	(54.5)
Wrong answer	89	(22.9)	320	(45.5)
Total	389	(100.0)	704	(100.0)
X ² = 54.53 P=0.000				
Knowledge on special diabetic food in the market				
Correct answer	187	(48.1)	235	(33.4)
Wrong answer	202	(51.9)	469	(66.6)
Total	389	(100.0)	704	(100.0)
X ² = 22.82 P=0.000				
Knowledge of disease complication				
Correct answer	243	(62.5)	358	(50.9)
Wrong answer	146	(37.5)	346	(49.1)
Total	389	(100.0)	704	(100.0)
X ² = 13.6 P=0.000				
Knowledge on diabetic foot and its complication				
Correct answer	178	(45.8)	264	(37.4)
Wrong answer	211	(54.2)	440	(62.6)
Total	389	(100.0)	704	(100.0)
X ² = 7.09 P=0.008				
Knowledge on problems of teeth in diabetics				
Correct answer	151	(38.8)	217	(30.8)
Wrong answer	238	(61.2)	487	(69.2)
Total	389	(100.0)	704	(100.0)
X ² = 7.17 P=0.007				
Knowledge on importance of practicing sports				
Correct answer	165	(42.4)	226	(32.1)
Wrong answer	224	(57.6)	478	(67.9)
Total	389	(100.0)	704	(100.0)
X ² = 11.6 P=0.000				
Health education on diabetes				
Yes	269	(69.2)	353	(50.1)
No	120	(30.8)	351	(49.9)
Total	389	(100.0)	704	(100.0)
X ² = 36.92 P=0.000				

identify the problems of teeth in diabetics. Less than one half of the patients (42.4%) and one third of the public (32.1%) were able to identify practicing sports as an important tool in the control of diabetes. More than two thirds of the diabetics (69.2%) were exposed to either formal or informal health education related to diabetes compared to half of the public (50.1%) (Table 1). More than half of the patients (58.4%) mentioned that they visited health care facilities regularly to check their health status and received treatment, and less than one third of them (30.3%) knew regarding the Saudi Diabetic Association and the services provided by it. The patient education is the cornerstone of care for patients with diabetes mellitus. Managing diabetes successfully requires a life long commitment to self-care. As patients are the most important decision-makers, they should receive enough instruction to make informed decisions regarding their treatment. However, there are surprisingly little data on knowledge levels of patients who have had diabetes for many years.

Generally, the knowledge of the patients regarding diabetes was better than that of the public; this could be attributed to health education provided mainly to diabetics. However, both groups had poor knowledge on disease complications and on special diabetic diet. These observations dramatically reinforce the American Diabetic Association recommendations for periodically re-assessing educational needs of the patients and identifying barriers to ongoing education for better control of the disease.⁵ More than half of the patients (58.4%) had regular visits to health care facilities for regular check up and treatment. This is a very important issue as patients who are not checked regularly are more prone to complications of the disease. There should be a diabetic registry, and all patients should be attached to the health center near to their residency. Home visits by nursing staff should be emphasized. Regular exercise and its effect in promoting good health are under-estimated in Saudi communities. This fact has been observed in the studied groups, where only 40% of the cases, and nearly one third of their control group could recognize practicing regular exercise as an important practice in controlling diabetes and promoting good health.

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Prevalence of malnutrition among end-stage renal disease patients in Jordanian Hospitals

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Protein-energy malnutrition and wasting, are common among patients with end-stage renal disease (ESRD). The nutritional status is strongly associated with morbidity and mortality in hemodialysis patients. In addition, quality of life is negatively correlated with a poor nutritional status.¹ A study of Devereaux et al² demonstrated an increased risk of morbidity and mortality in private (for-profit) hospitals when compared with governmental (non-for-profit) hospitals. This could be attributed to many factors; one of these factors is that, private hospitals employ fewer personnel per dialysis run and less highly skilled personnel; another reason is the shorter duration of dialysis treatment in private hospitals. Facing a difficult economic challenge due to the fixed fund may also contribute in decreasing the dialysis quality in private hospitals.² Subjective global assessment (SGA) questionnaire is recently used to assess the degree of malnutrition in hemodialysis patients. It has been reported that, use of SGA in detecting malnutrition is simple, valid, noninvasive, and applicable.³ Many studies showed that SGA is a simple tool, and it correlates significantly with some nutritional parameters.^{3,4} In Jordan, there are no data of the prevalence and the degree of malnutrition in hemodialysis patients in either governmental or private hospitals. This lack of

data may be due to that assessing the nutritional status of hemodialysis patients is not a routine practice in Jordanian hospitals. Therefore, this study was conducted to compare the prevalence of malnutrition among a representative sample of Jordanian ESRD patients who are treated with hemodialysis in both governmental and private hospitals. Assessing the nutritional status of those patients was carried out by using the SGA.

In this study, a sample of 180 (91 women and 89 men) ESRD out-patients who underwent hemodialysis was recruited from dialysis units. The study was conducted in 5 large hospitals (3 governmental and 2 private) in 2 main cities (Amman and Irbid) in Jordan from 2004 to 2005. The main causes for renal failure in the 180 patients were diabetic nephropathy, kidney stones, primary hypertension, and chronic glomerulonephritis. The inclusion criteria of the sample were patients undergoing hemodialysis for at least 6 months and aged 17 years or older. Patients with acute morbidity such as infections, elevated body temperature, wounds, respiratory and gastrointestinal distresses, as well as patients aged >75 years were excluded. The SGA questionnaire is based on the history and physical examination of the selected patient. Patient's history consists of 5 components: weight loss (during the last 6 months), gastrointestinal symptoms, food intake, functional capacity, and comorbidity. Each of these features are rated separately as A, B, and C indicating the degree of malnutrition. The SGA grades were determined by one experienced renal dietitian to minimize personal measurement error. The authors found that the average age of patients was 44.2 years; the private patients' age was lower than the governmental patients. **Figure 1** showed the differences in SGA grades between governmental and private hospitals. The present study showed that the nutritional status for both governmental and private hospitals was similar. Thirty-eight and 39% of the governmental and private hospital patients were classified in SGA A (well-nourished), respectively, while 62 and 61% of the governmental and private hospital patients were classified in SGA B and C (moderately to severely malnourished), respectively. This indicates that there is no difference in SGA grades between governmental and private hospitals. According to the average for the SGA classification for both governmental and private hospitals, 38.3% of patients were well-nourished, 56.8% were moderately malnourished, and 5% were severely malnourished. The prevalence of malnutrition in the present study was as high as 61.8% of hemodialysis patients, which

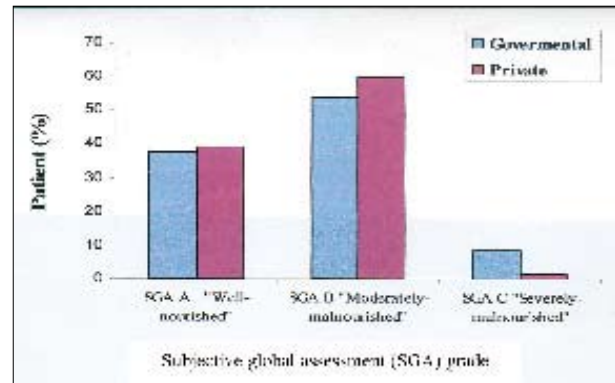


Figure 1 - Prevalence of malnutrition among end-stage renal disease (ESRD) in both Governmental and Private Hospitals (N=180).

is supported by the results of other studies. Mehrotra and Kopple,⁵ showed that the estimates of malnutrition prevalence vary, but the average throughout the world is approximately 40%. The researchers reported that most of those patients were classified to have mild to moderate malnutrition; specifically 6-8% was having severe malnutrition.⁵ A study of Qureshi et al⁶ indicated that the percentage of well-nourished patients were 36%; mildly malnourished was 51%; and severely malnutrition was 13% in Sweden hemodialysis patients.

We concluded that even though it is expected that patients in private hospitals have a worse nutritional status than those in the governmental hospital, the present study showed that there was no significant difference in malnutrition degree between patients who were treated in either private or governmental hospitals.

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Mandatory child restraint systems in the Arabian Gulf Countries. The time has come

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Unintentional injuries are the preventable public health problem worldwide. Each year, road traffic accidents claim 1.2 million lives and injure or disable as many as 50 million more. Road traffic accidents are the second leading cause of death globally among young persons aged 5-29 years. Previous studies have shown that casualty and fatality rates in Gulf countries are much higher than in developing countries with comparable vehicle ownership levels. For example in 2004, in the United Kingdom there were 0.72 and United States 1.51 road traffic fatalities per hundred million vehicle kilometers, whereas in the United Arab Emirates (UAE) they recorded a disproportionate 3.33 deaths per hundred million kilometers.¹ In the same year, the road traffic mortality in Oman was 28 per 100,000 population, far above the global average of 19 per 100,000 persons, and more than one-third of those who died were <25 years.² Over the past 2 decades, research has provided a clear understanding of the circumstances surrounding motor vehicle injuries in children, and the demographic risk and protective factors that influence the likelihood that a child will be injured. Riding unrestrained is the single most important risk factor for death and injury among children in motor vehicle accidents. In 2000, approximately 47% of motor vehicle fatalities among occupants in the US involved unrestrained children

aged <5 years. In most Arabian Gulf countries, infant and child safety seat usage is disturbingly low, and injuries from road traffic accidents claim the lives of more children than any other means of death. Around the globe, mandatory use of child restraint systems and adult seat belts has significantly reduced injuries of occupants involved in crashes. A critical question is, why Gulf countries do not mandate the use of protective restraints for their children as they do for their adults? Governments have a financial interest and a moral responsibility for assuring the safety of their children. Medical costs for injuries sustained during vehicular accidents are ultimately borne by the Ministries of Health. Injury prevention can reduce medical costs and save lives. In a cost-outcome analysis of 84 injuries prevention or control measures in the US, interventions associated with the highest benefit-cost ratios included safety belts in front seats, safety belt laws with primary enforcement, and child safety seats.³ The magnitude of the vehicular injury problem in the Gulf, dictates the need for more research into road traffic accidents and associated risk factors. In our region of the world, there is a paucity of data evaluating parental knowledge, attitudes, perceptions, and acceptance of child restraint systems. However, in one cross-sectional population-based study of parental views on road safety in Al-Ain, UAE, parents of primary school children demonstrated widespread awareness of road safety problems in the country.⁴ In the US, factors influencing child safety seat non-use include lifestyle factors, transportation and trip circumstances, non-parent or non-driver issues, parenting style, child's behavior, and perceived risk of nonuse of child car safety seats. Social, cultural, and economic factors, not just legislation, govern child restraint use. Research studies are needed in the Gulf nations, to determine the unique barriers that lead to child safety device non-use. Apart from the promotion of use of the child restraint systems, an added challenge is to reduce incorrect use of child safety seats. The 3 most often occurring child safety seat misuses includes, seats not belted into the motor vehicle tightly, safety harness straps not snug, and harness retainer clips not at the armpit level. In one study from the US, drivers with a high occurrence of incorrect use, as compared with drivers with lower misuse, had lower educational levels, removed the child seat more often from their vehicle, were not the parent of the child, and had children who were smaller and younger. Several studies offer insight into how parents make safety choices for their children. In California, researchers found that ticketed violators of the state's

Child Passenger Safety Law scored better on child safety tests after attending a class on knowledge and general child safety seat use. Using a questionnaire technique to evaluate injury prevention counseling to improve safety practices by parents in Mexico, data obtained on 124 children showed that overall safety scores (percentage safe response) before counseling increased from 59% and 65% for parents from lower and upper socioeconomic strata, respectively, to 62% and 73% after counseling ($p < 0.01$ for all groups). A major benefit of child restraint systems is a reduction in head injuries, potentially attributable to a reduction of head excursion in crashes. Parents must be able to select the most appropriate restraint for their child's age and weight, and be knowledgeable in the proper installation of the selected restraint system in order to optimize their child's protection. Not all safety seats are created equal and shield booster seats may have an increased risk of injury compared to forward-facing child safety seats. Furthermore, premature graduation of young children from child restraint seats to seat belts puts them at greatly enhanced risk of injury in crashes. As in other jurisdictions, Arabian Gulf countries need to close the gap between science and public policy. This could be the best accomplished by a combination of effective legislative, engineering, educational, and enforcement measures. As previously suggested by the National Institutes of Health, Task Force of Community Prevention Services in the US,⁵ strategies for decreasing motor vehicle child occupant injury in the Gulf should include: 1) National legislation requiring infant and child safety seats. 2) Community-based child safety programs. 3) Incorporation of child passenger safety education and counseling (anticipatory guidance) into routine well-child visits to pediatricians and community health centers. 4) Primary and enhance enforcement of safety restraint laws. Medical students and physicians-in-training should receive formal training in appropriate child safety seat use. Preventable disease, despite the type, must be prevented and the protection of the Gulf nations' children must continue to be a paramount priority. The immobility of indecision has taken its

toll on other countries' children for other conditions. For example, during the past decade in South Africa, thousands of children were needlessly infected with the human immunodeficiency virus from their seropositive mothers due to the government's failure to initiate country-wide provision of maternal zidovudine prophylaxis, even when this simple prevention measure was repeatedly demonstrated to be cost-effective. Each year, road traffic accidents continue to result in substantial wastage of life and national resources in the Arabian Gulf countries. Success in reducing motor vehicle morbidity and mortality will require close intersectoral collaboration between traffic police and health, law, and transportation authorities. The time has come for the Arabian Gulf countries to take steps to legislate and strictly enforce mandatory use of child safety devices in all passenger vehicles on the roads. Our children deserve nothing less.

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