world is caution not panic. They should be aware of the protean symptoms of SARS and follow the advise available at the WHO Web site (http://www.who.int/csr/sars/guidelines/en/) or the CDC website(http://www.cdc.gov/ncidod/sars/clinicians.htm). Clinicians evaluating suspected cases should use standard precautions (for example, hand hygiene) together with airborne precautions (for example, an isolation room with negative pressure relative to the surrounding area and use of N-95 filtering disposable respirator for persons entering the room) and contact (for example, gowns and gloves) precautions. Until the mode of transmission has been defined more precisely, eye protection also should be worn for contact with patients or their environment. Clinicians who suspect cases of SARS are requested to report such cases immediately to their public health authorities. Initial steps toward vaccine development have already begun. Vaccines are successful in preventing coronavirus infection in animals. Hence, the development of an effective vaccine against this new coronavirus is a realistic possibility.

In summary, SARS is an emerging disease that has sickened to date over 8,202 persons on 5 continents. A cumulative list of affected countries and numbers of cases and deaths is released each day on the WHO web site. Speed of scientific discovery and speed of communication are hallmarks of the response to SARS and reflect amazing achievements in science, technology and international collaboration. Awareness of the disease is now very high throughout the world. An increase in the number of suspected cases is to be expected in such an atmosphere of heightened awareness as cases being quickly identified and immediately isolated. Surveillance is proving to be sensitive, with suspected cases rapidly detected, reported to national authorities and WHO, and investigated according to the standard case definition which is being updated as more information becomes available. Knowledge regarding its clinical behavior, diagnostic procedures, response to treatment, and modes and risks of transmission are continually evolving.

The world health community is confident that, in the present climate of heightened awareness, rapid and detailed reporting and a cooperative network of scientists and clinicians working around-the-clock on improving the precision of diagnostic tests to put case definition on a laboratory rather than a clinical basis and developing a reliable treatment, it can and will succeed in bringing this epidemic under control. This will be a very welcomed development by some countries such as the Kingdom of Saudi Arabia where preparations are underway for the next pilgrimage season in which over 2,000,000 Muslims from all over the globe are expected to participate.

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# End stage renal disease experience in a general hospital in Eastern Saudi Arabia

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Saudi Aramco (the Saudi Arabian American Oil Company) (SA) is a major employer in the Eastern region of the Kingdom of Saudi Arabia (KSA). It is the largest oil producing company in the world. There are currently around 60,000 employees distributed throughout KSA. The main bulk of these employees are located in the Eastern region, where oil production takes place. Saudi Aramco employees are of multi nationalities, the majority of which are Saudi citizens (90%). All major tribes of the Saudi population are represented in SA. Saudi Aramco offers comprehensive medical care to its employees and their dependents: spouses, parents, and children. Approximately 500,000 individuals (employees and dependents) are eligible for medical care at SA. One half of these individuals (250,000) are treated at Dhahran Health Center (DHC), and the rest are contracted for treatment in private hospitals distributed across the KSA. Over the years, the then simple medical facility, DHC has evolved into a state of the art 600-bed referral institution, in addition to several satellite clinics and local hospitals. Dialysis started at DHC in the early 1980's. Within a relatively short period of time the dialysis population rapidly expanded. In this article we retrospectively report our experience with end stage renal disease (ESRD) over a 4 year period starting January 1998 through December 2001.

Patients who developed ESRD and started hemodialysis (HD) or peritoneal dialysis (PD) at DHC were included. Patients who developed ESRD and did

Table 1 - Demographics of the dialysis population.

| Age (years) | Dialysis (%) HD | PD | M:F | Etiology of ESRD (%) DM | HTN | GN | Others | Hep C (%) | Hep B (%) | Annual mortality (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| 60 | 98 | 2 | 1:1 | 60 | 11 | 8 | 21 | 17 | 1.4 | 8 |

M - male, F - female, ESRD - end stage renal disease, DM - diabetes mellitus HTN - hypertension, GN - glomerulonephritis, Hep C - hepatitis C, Hep B - hepatitis B, HD - hemodialysis, PD - peritoneal dialysis

not start dialysis for any reason such as poor candidacy or refusal to accept dialysis were excluded. Only adult patients, patients above age 14 years and those who survived the first month on dialysis were included in the analysis. An average of 37 adult patients started dialysis at DHC each year. Considering the population of 250,000, this translates into an annual incidence of 148 per million. All patients were of Saudi nationality. The majority of patients, 97.8%, were on HD compared to only 2.2% who received PD. Only on rare occasions was PD chosen as a first modality of renal replacement therapy, and in the majority of cases it was performed due to difficulty in maintaining a HD access. Continuous cycling PD (CCPD) was the modality chosen in all patients who performed PD. Diabetic nephropathy was the cause of ESRD in the majority of cases contributing to 60% of all causes of ESRD. Hypertensive nephrosclerosis and glomerulonephritis contributed to 11% and 8 % of all causes of ESRD **(Table 1)**. Other causes of ESRD such as polycystic kidney disease, obstructive uropathy, and renal dysplasia contributed to the rest of the causes of ESRD (21%). The mean age of our dialysis patients at the start of dialysis was 60 years, with a male to female ratio of 1.07:1. Forty percent of our patients began dialysis with a functional permanent access. Refusal of dialysis was the primary cause for delay in creation of a permanent dialysis access. Overall prevalence of Hepatitis C (Hep C) was 17%. The prevalence of Hep C positive status was found to be only 5.4% among those patients who started dialysis in year 2001. On the other hand, prevalence of Hepatitis B (Hep B) carrier state was very low. Only 2 patients (1.4%) were carrier for Hep B virus (surface antigen positive), and none of our patients carried the Human Immunodeficiency Virus (HIV). Seroconversion rate for both Hep B and C was 0%. The overall annual mortality averaged 8% over the study period. Among the various admission diagnoses, malfunction of the dialysis access accounted for 31% of all admissions followed by cardiovascular and cerebrovascular events (14%), and gastrointestinal symptoms (11%). Average duration of hospitalization for new patients with ESRD and readmissions was 21.5 and 8 days.

Although our population is located in the Eastern region of KSA, all major tribes of the Saudi population are well represented. The diversity among the employees makes the SA population representative of the Saudi population as a whole. Historically, SA employees and dependents have received a high quality of medical care in one of the most established medical facilities in the Kingdom. The systematic follow up of patients and the excellent preservation of medical records make SA patients easily captured and studied. As compared to the rest of the KSA, our dialysis population is older with a mean age of 60 years at the start of dialysis. According to the published data by the Saudi Center of Organ Transplantation (SCOT), the mean age of dialysis patients in KSA is 48 years.[1,2] There are several plausible explanations for the difference in mean age between our population and that reported by SCOT. Resources at SA facilities are higher than the rest of the country, and therefore dialysis may be offered to older patients and those who are believed to be less than ideal candidates for renal replacement therapy. In support of this explanation is the higher proportion of diabetics (60%) who entered our dialysis program as compared to the rest of the country. This is one of the highest proportions of diabetics entering the dialysis programs in the world.[1-4] In comparison, the proportion of diabetics who started dialysis in KSA was 16% and 27% for the year 1999 and 2000.[1] We expect the proportion of diabetics entering the dialysis program in KSA to increase further over the next few years and the discrepancy with our population will probably diminish. According to SCOT's data, the number of dialysis patients has been increasing steadily over the past few years, and has reached around 7000 patients in year 2000.[1] If the current trend persists, the predicted number of ESRD patients in KSA will reach 18,000 by the year 2010. Having a large dialysis population with a great proportion of diabetics will pose a big challenge on nephrologists and health care policy makers in this country. There is a wealth of data indicating an epidemic of type II diabetes mellitus in KSA, probably more than in other societies, and therefore lots of efforts need to be invested to prevent diabetic renal disease.[4,5] One of the other features of our dialysis population is the low prevalence of Hep C. Published data show that around 50% of all patients on hemodialysis across KSA are positive for Hep C.[1] Prevalence of Hep B carrier state is also less in our population than that published by SCOT (1.4% as compared to 6.7%).[1] The well controlled environment, the meticulous infection control that is applied routinely in our unit, and the isolation

procedures for Hep C positive patients explain the low prevalence and conversion rate of both Hep B and C. The other striking feature in our cohort of dialysis patient is the relative low mortality rate. Over the 4 year period, mortality of our patients averaged 8% per year. This is a low rate considering the high proportion of diabetics and the relatively high mean age of our dialysis population.

Peritoneal dialysis has not been popular among our patients despite all efforts to select patients who may benefit the most from this modality such as younger individuals and active employees. Traditionally, the majority of PD patients were former HD patients who had been switched to PD due to vascular complications and lack of adequate vascular access.

In conclusion, our dialysis population is a unique group of patients that exhibit certain features that distinguish them from the rest of the country. That includes an older age, a greater proportion of diabetics, a low prevalence of Hep C and B, and a low mortality rate. We expect a dramatic increase in dialysis population across the country, as more diabetics will be entering the dialysis program over the next few years. This will have a major impact on the health economy of our country. Efforts to target diabetic population should be intensified in order to prevent and or delay the catastrophic outcome of diabetic nephropathy.

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