Effect of Intradialytic Aerobic Exercise among Hemodialysis Patients in the United Arab Emirates on Clinical Outcomes, Barriers to Physical Activity, and Quality of Life

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Sedentary lifestyle is a prevalent condition in hemodialysis (HD) patients, and is associated with an increased risk of mortality. Many factors contribute to the decreased physical activity (PA) in HD patients; these include metabolic acidosis, ureamia, inflammation and malnutrition. In addition, fatigue, lack of energy, comorbidities, lack of time and lack of access are the common reported barriers to PA by HD patients. On the other hand, active HD patients have higher quality of life (QOL). Unfortunately, there are no recommendations for PA tailored to HD patients.

Another common condition and risk factor for mortality in HD patients is hyperphosphatemia. The management of hyperphosphatemia in HD patients relies on the routine dialysis, the low phosphorus (P) diet, and the intake of phosphate binders. However, reaching the therapeutic target for P is not always achieved.

In an attempt to counteract sedentarism and hyperphosphatemia, and thus decrease mortality and increase quality of life (QOL), researchers are considering adjunct therapy for HD patients. The aim of this dissertation is to study the effect of intradialytic aerobic exercise among HD patients in the United Arab Emirates (UAE) on clinical outcomes, barriers to PA and QOL. The positive effect of IDE was evident in the literature; it can ameliorate solute clearance, serum P, QOL, overall health and most importantly, decrease the hospitalization rate. As in many countries, IDE programs are not yet part of the routine practice of HD patients in the UAE. In fact, this study pioneered in exploring IDE in the UAE, thus analyzing the feasibility of such a program in a developing country, since most of the evidences in this field come from developed Western countries.

In ***chapter 2***, we conducted a systematic review on all published aerobic IDE interventions. Studies on aerobic IDE that included at least 1 of the outcome variables [Kt/v, Urea reduction ration (URR), serum P, QOL, vitamin D3, parathyroid hormone (PTH), C-reactive protein (CRP), cost effectiveness, hospitalization rate, number of emergency HD, intake of P binders, mortality) were included. We could not report on all of the outcome variables because some were unavailable in the selected studies. The available extracted information allowed us to conduct a meta-analysis on QOL – physical component score (PCS), QOL – mental component score (MCS), dialysis efficiency (Kt/V), and P. Results of this review showed that IDE did not lead to any health hazards in the HD population, and its incorporation in the routine practice can result in significant improvement in QOL – PCS, and QOL – MCS, but not in P levels, or Kt/V.

In ***Chapter 3***, we presented a detailed protocol of our intervention, and the baseline sample characteristics. It was a 6 months quasi-experimental intervention on HD patients in Al Qassimi hospital in the UAE. The overall study lasted for 12 months and had 3 phases. The outcome measures were demographics and biochemical markers [Serum P mg/dl, PTH pmol/L, Calcium Phosphorus Product (Ca x P) mg^2/dl^2, Hemoglobin (HGB) g/dl, Kt/v, URR %]; in addition to 4 questionnaires: 1) Malnutrition Inflammation Score (MIS) questionnaire, 2) Exercise Behavior, attitude and knowledge questionnaire, 3) Barriers to physical activity questionnaire, and 4) QOL questionnaire. In phase 1 (2 months), the research team verified the planned intervention methods and offered a 1 month individualized patient education on the importance of PA to their health. Also, the concept of IDE was introduced. At the end of this phase, we conducted the baseline assessment. In phase 2 (6 months), all consenting participants undertook the IDE training on a static pedaler, for 45 minutes, 2-3 times per week. In parallel, patients received a monthly education on the benefits of exercise for HD patients, and how to implement it safely in their lifestyle. At the end of this phase, post intervention assessment was done on all studied parameters. In phase 3 (4 months), the research team refrained from seeing the patients for 3 months and reassessed the patients on all parameters in the last month. Forty-one patients were included in the study, out of which 75% were hyperphosphatemic (serum P > 4.6mg/dl).

In ***Chapter 4***, we explored the effects of IDE on hyperphosphatemia, MIS, URR and QOL. We found that IDE is safe and could be beneficial especially for hyperphosphatemic patients who witnessed a decrease in P that almost reached significance. This intervention had no significant change on URR and QOL. An interesting observation was related to the religious beliefs of the patients, which might have impeded them from objectively assigning a score to their health status on the QOL-visual analogue score; patients tended to give a high score as, otherwise, they would be defying their fate, or God's will. At the end of the study, MIS remained stable, however, because no control group was included, we could not assess whether IDE prevented the normal deterioration of the nutritional status of HD patients occurring over time.

Chapter 5 presents the effects of IDE and patient education on patients' attitudes, knowledge and barriers to PA. Also, it investigates the attitudes of nephrologists and nurses to PA in HD patients. Our results showed that the majority of the patients agreed on the importance of exercise to their health. However, the main barriers

identified by the HD patients after the completion of the IDE program were “fatigue on dialysis days”, “too many medical problems”, “pain on dialysis days”, and “fatigue on non-dialysis days”. In addition, the provided individualized counseling reflected an increase in patients’ knowledge about the safety of exercise at the end of the study. As for the nephrologists, they recognize the importance of PA in HD patients but still did not prescribe it, as they are concerned about its risks. Finally in ***Chapter 6***, we reported a cross sectional study assessing malnutrition that we conducted on 70 HD patients at the same hospital. It explored the concordance of the MIS and the bioelectrical impedance analyzer derived phase angle (PhA) in the spectrum of the Global Initiative on Malnutrition (GLIM) criteria. Almost half of the sample was diagnosed as malnourished either by the MIS (48.57%) or based on the GLIM criteria (54.29%). Statistical analysis showed that MIS tool performed slightly better than PhA in the diagnosis of malnutrition in the spectrum of the GLIM criteria. In addition, knowing that ethnic differences may affect body composition, we derived the optimum cut-off point of PhA in our sample according to GLIM criteria, which was ≤5.7° for males and ≤3.8° for females.

The results of this dissertation could generate several implications for HD clinical practice in the UAE. First, it highlights the hyperphosphatemic HD patients as the target population for this type of intervention. Second, it gives an idea about the responsiveness to an IDE program in this multi-ethnic population, and the specific barriers that should be tackled to ensure patients’ compliance. Also, it brings up the influence of religion on patients’ perceived QOL, something that researchers should consider when evaluating QOL in this population. Finally, the above implications could serve as directions for future research in this field in the UAE.