

Marital Adjustment in Patients on Long-Term Hemodialysis A Case-Control Study

Seyed Abbas Tavallai,^{1,2} Eghlim Nemati,^{1,2}
Hamid Reza Khoddami Vishteh,^{3,4} Mehdi Azizabadi Farahani,^{3,4}
Maryam Moghani Lankarani,⁴ Shervin Assari⁴

¹Behavioral Sciences Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran

²Nephrology and Urology Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran

³Clinical Research Unit, Baqiyatallah University of Medical Sciences, Tehran, Iran

⁴Medicine and Health Promotion Institute, Tehran, Iran

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Introduction. This study was conducted to compare marital adjustment between patients on long-term hemodialysis and healthy controls and to determine whether the psychological symptoms correlate with marital adjustment in these patients.

Materials and Methods. In a case-control study, 40 patients on long-term hemodialysis and 40 healthy participants were compared for the quality of marital relationship. The Revised Dyadic Adjustment Scale was used for interviews of marital relationship, which includes total marital adjustment and its subscales of marital consensus, affection expression, marital satisfaction, and marital cohesion. Symptoms of anxiety and depression and the Ifudu comorbidity scale were also assessed in the patients group.

Results. Marital consensus, affection expression, marital satisfaction, marital cohesion, and the overall marital relationship were significantly poorer in the patients on hemodialysis than in the controls. Also, symptoms of anxiety were more severe among the patients on hemodialysis in comparison with that in the controls. However, this was not the case for symptoms of depression. In the patients on hemodialysis, the severity of anxiety slightly correlated reversely with the total marital relationship score and marital satisfaction subscale. Depression correlated reversely with total marital adjustment, affection expression, marital satisfaction, and marital cohesion. Finally, some marital relationship subscales showed poorer results in men on dialysis, younger patients, and those with higher educational levels.

Conclusions. Marital adjustment in patients on hemodialysis, which is linked with depressive symptoms and anxiety, is poorer compared to the healthy controls. This finding shows the necessity of an appropriate family approach for patients on long-term dialysis.

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INTRODUCTION

Although the concept of health may not sound similar to all researchers, most believe that in addition to physical and mental well-being, social well-being is an important part of it.¹ Marital adjustment is considered as a part of social well-being, disturbed marital relationship adversely affects physical health, mental health, the quality of life, and even economic status of individuals.²⁻⁴ This

may also affect children of the family, especially when marital discord or divorce appears.⁴

For several patients with chronic illnesses, marital relationship is a serious concern.⁵ It can directly affect the disease adjustment and the way they face disease outcomes and complications.^{6,7} In a study focused on marital aspects of patients with end-stage renal disease (ESRD), it was reported that close persons to the patients rated their quality of life

as excellent and reported little pressure resulting from their caregiving responsibilities⁸; in another study, ESRD and dialysis were shown to increase the close person's sense of responsibility and to lead to a poorer quality of life when compared with age-matched controls.⁹ Close persons find living with a patient with ESRD on dialysis stressful and experience increased fatigue.¹⁰ The demanding nature of caregiving for a patient with ESRD often leads close persons to neglect their own health. On the other hand, those who regularly take time to have a break from their caregiving responsibilities had a health status.¹¹ Other issues that close persons report include isolation and the loss of social activity, life restrictions, increased workload, negative economic consequences, changed relationship with the patient, and sexual problems.¹²⁻¹⁶

While studies in Iran on the marital relationship have included only patients who receive kidney transplantation,¹⁷⁻¹⁹ our knowledge on the Iranian patients receiving hemodialysis is limited, and nearly all evidence on this subject has been derived from developed countries with different culture and marital relationship.²⁰ This study was designed to compare the status of marital adjustment between patients on long-term hemodialysis and healthy controls, and to assess whether the psychological health indicators are within the correlates of marital relationship quality in this population.

MATERIALS AND METHODS

Patients

This case-control study was conducted in outpatient setting, at Baqiyatallah Hospital, in Tehran, Iran, in 2006. Informed consent was obtained from all recruited patients and healthy participants, and the study protocol was approved by the Ethics Committee of Baqiyatallah University of Medical Sciences, Tehran, Iran. Participants were selected from among patients on long-term hemodialysis in hemodialysis department of Baqiyatallah Hospital and healthy individuals who were volunteers for blood donation at Tehran Blood Transfusion Organization. The inclusion criteria were having an age of between 20 and 60 years, being married, attachment to one single spouse, and for the patients, being on hemodialysis for at least 3 years. Patients and controls whose spouse suffered from a chronic disease were excluded from the study.

Accordingly, a total of 40 patients were selected and 40 volunteers for blood donation without chronic conditions were randomly recruited.

Study Design

Demographic information including sex, age, occupation, and educational level were collected as well as specific data regarding marriage (previous marriages, duration of the current marriage, number of children, familial relationship with spouse, previous divorce). In the patients with ESRD, primary cause of ESRD, duration of the disease, and hemodialysis schedule were recorded. The quality of marital relationship, symptoms of anxiety and depression, and comorbidities were assessed through interviews using Persian translations of the Revised Dyadic Adjustment Scale (RDAS), Hospital Anxiety and Depression Scale (HADS), and the Ifudu index.²¹⁻²³

Revised Dyadic Adjustment Scale. The RDAS consists of 14 items evaluating a couple's agreement on decisions and appropriate behavior, marital satisfaction, and marital cohesion.²¹ The RDAS scores range from zero to 69, with "distressed relation" having the lowest score. It provides a total marital adjustment score, and 4 subscores of marital consensus (couple's agreement on matters of importance to the relationship; scores ranging from zero to 20), affective expression (demonstrations of affection and sexual relationship; scores ranging from zero to 10), marital satisfaction (satisfaction of the couple with their relationship; scores ranging from zero to 20), and marital cohesion (closeness and shared activities; scores ranging from zero to 19). The Cronbach α was found to be 0.898, 0.683, 0.779, 0.827, and 0.836 for the total RDAS, marital consensus, affection expression, marital satisfaction, and marital cohesion, respectively. The Persian translation of the RDAS has been widely used in Iran.^{17,18}

Hospital Anxiety and Depression Scale. The HADS comprises 14 statements relevant to generalized anxiety (7 items) and depression (7 items).²² Each item has 4 possible answers with scores ranging from zero to 3. The maximum score was 21 for each scale. Furthermore, the total score was calculated as the total HADS score. The Cronbach α was 0.815. The Persian version of this scale has been previously used in Iran.^{24,25}

Ifudu Index. The comorbidity index designed

by Ifudu and colleagues²³ is a numerical scale which measures comorbidity in patients and has 14 components for evaluation of 14 main body systems. The conditions evaluated in this scale are ischemic heart diseases, other cardiovascular problems, chronic respiratory diseases, autonomic neuropathies, other neurological problems, neuromuscular and musculoskeletal disorders, infections, pancreas and biliary diseases, hematological disorders (excluding anemia), low back pain, spine or joint disorders, visual disorders, limb amputation, mental or emotional illness, and genitourinary diseases. Each component takes scores ranging from zero to 3 which correspond to the absence of to the presence of severe comorbidity, respectively. Total comorbidity score would be the sum of scores gained from each of the above components.

Statistical Analyses

The SPSS software (Statistical Package for the Social Sciences, version 13.0, SPSS Inc, Chicago, Ill, USA) was used to perform statistical analyses. Concerning the normal distribution of the total RDAS scores and its all subscores in the studied groups, investigated by the Kolmogorov-Smirnov test, the independent sample *t* test was applied to assess their differences between the studied groups. The bivariate Pearson correlation coefficient test was used for assessing the correlations between RDAS scores and its all and the HADS scores. *P* values less than .05 were considered significant.

RESULTS

The patients and the controls were not

significantly different in terms of age, sex, and educational level. Summary of these characteristics are outlined in Table 1.

The scores of the total RDAS and all its subscales including marital consensus, affection expression, marital satisfaction, and marital cohesion were significantly lower in the patients on hemodialysis in comparison with the controls (Table 2). The HADS analysis showed that the symptoms of anxiety were more severe among the patients on hemodialysis in comparison with that in the controls (HADS anxiety subscale, 9.91 ± 2.79 versus 8.23 ± 3.09 , respectively; $P = .002$). However, this was not the case for symptoms of depression (HADS depression subscale, 8.48 ± 3.35 versus 9.28 ± 2.13 , respectively; $P = .13$).

In the patients on hemodialysis, the severity of anxiety slightly correlated with the total RDAS ($r = -0.211$, $P = .05$) and marital satisfaction subscale ($r = -0.262$, $P = .02$), and also, the severity of depression correlated with total marital adjustment ($r = -0.340$, $P = .002$), affection expression ($r = -0.222$, $P = .05$), marital satisfaction ($r = -0.314$, $P = .005$), and marital cohesion ($r = -0.274$, $P = .02$). Finally, the association between marital relationship quality and age, gender, educational level, and comorbidity level in the patients on hemodialysis are presented in Tables 3 and 4.

DISCUSSION

This study had two aims: to compare marital adjustment between patients on hemodialysis, and healthy controls and to determine whether the psychological symptoms correlate with marital

Table 1. Characteristics of Patients on Hemodialysis and Healthy Participants*

| Characteristic | Patients on Hemodialysis | Controls | <i>P</i> |
|-------------------------------|--------------------------|------------|----------|
| Mean age, y | 51.7 ± 13.5 | 47.2 ± 7.6 | .07 |
| Male gender | 26 (65.0) | 27 (67.5) | .81 |
| Education level ≥ high school | 17 (42.5) | 25 (62.5) | .07 |
| Comorbidity score | 7.7 ± 5.8 | 3.0 ± 5.1 | < .001 |

*Values in parentheses are percents.

Table 2. Mean Scores of Revised Dyadic Adjustment Scale and Its Subscales in Patients on Hemodialysis and Healthy Participants

| Scales | Patients on Hemodialysis | Controls | <i>P</i> |
|----------------------------|--------------------------|------------|----------|
| Marital consensus | 15.8 ± 3.3 | 17.7 ± 2.1 | .003 |
| Affection expression | 8.1 ± 2.0 | 8.8 ± 1.7 | .04 |
| Marital satisfaction | 15.4 ± 3.8 | 16.9 ± 2.8 | .049 |
| Marital cohesion | 11.9 ± 4.2 | 13.9 ± 3.3 | .02 |
| Overall marital adjustment | 51.2 ± 10.2 | 57.3 ± 5.4 | .001 |

Table 3. Mean Scores of Revised Dyadic Adjustment Subscales in Relation to Demographic Characteristics of Patients on Hemodialysis

| Scales | Age | | | Sex | | |
|----------------------------|-------------|------------|------|------------|-------------|------|
| | < 50 | ≥ 50 | P | Male | Female | P |
| Overall marital adjustment | 47.1 ± 11.3 | 56.2 ± 5.8 | .004 | 48.8 ± 9.1 | 55.6 ± 11.0 | .004 |
| Marital Consensus | 14.4 ± 3.5 | 17.5 ± 2.0 | .002 | 15.1 ± 2.9 | 17.1 ± 3.6 | .07 |
| Marital Expression | 7.6 ± 2.3 | 8.7 ± 1.4 | .08 | 7.7 ± 2.1 | 8.8 ± 1.5 | .09 |
| Marital satisfaction | 14.8 ± 4.6 | 16.1 ± 2.6 | .31 | 15.3 ± 3.4 | 15.4 ± 4.7 | .95 |
| Marital cohesion | 10.3 ± 4.3 | 13.9 ± 3.1 | .005 | 10.7 ± 4.0 | 14.3 ± 3.6 | .007 |

Table 4. Mean Scores of Revised Dyadic Adjustment Subscales in Relation to Education Levels and Comorbidity Scores of Patients on Hemodialysis

| Scales | Education | | | Comorbidity | | |
|----------------------------|-------------------|------------------------|-----|-------------|------------|-----|
| | Below High School | High School and Higher | P | < 8 | ≥ 8 | P |
| Overall marital adjustment | 54.1 ± 9.8 | 47.2 ± 9.5 | .03 | 50.4 ± 11.6 | 52.2 ± 8.4 | .58 |
| Marital Consensus | 16.7 ± 2.9 | 14.6 ± 3.4 | .04 | 15.6 ± 3.1 | 16.0 ± 3.5 | .73 |
| Marital Expression | 8.3 ± 2.1 | 7.7 ± 1.8 | .31 | 8.1 ± 2.1 | 8.0 ± 1.8 | .83 |
| Marital satisfaction | 16.0 ± 3.5 | 14.6 ± 4.2 | .27 | 14.7 ± 4.5 | 16.2 ± 2.8 | .21 |
| Marital cohesion | 13.1 ± 4.1 | 10.3 ± 3.9 | .03 | 11.9 ± 4.6 | 11.9 ± 3.7 | .97 |

adjustment in these patients. Regarding the first aim, this study showed that marital adjustment was markedly disrupted in patients on long-term hemodialysis, in comparison with matched healthy individuals. This reduction in the marital relationship quality is reflected in several behaviors of the couples, including the amount they agree on matters of importance to the relationship, demonstration of affection and sexual relationships, satisfaction with the relationship, and closeness and shared activities experienced by the couple. Concerning the second aim, this study reported a link between symptoms of anxiety with most of the above aspects of marital relationship in patients on hemodialysis. Another interesting finding in our study was that some marital adjustment qualities were poorer in men on dialysis, in younger patients, and in those with higher education levels (Tables 3 and 4).

Little research has been performed assessing patients with end-stage renal disease (ESRD) as parts of marital relationship or within family structures. Low and colleagues²⁶ reviewed the literature on close persons to the patients with kidney disease and identified 2 main areas of impact. Firstly, both hemodialysis and peritoneal dialysis had a disruptive influence on family members' social lives. Secondly, some patients became frail and lost functional independence, leaving family members to provide greater physical support. On the other hand, family members may have health and social care needs of their own that need to be addressed.²⁷

In one study, a marital role theory approach was used to investigate individual psychosocial well-being and marital adjustment in 89 patients with ESRD and their spouses.²⁸ In that study, 4 different patient groups were selected, including predialysis, in-center dialysis, home dialysis, and posttransplant patients. Analyses demonstrated that increased perceived intrusiveness of ESRD was significantly related to greater marital role strain, poorer marital adjustment, and decreased individual well-being. This supported the idea that perceived intrusiveness might be an important mediator of marital role strain and of coping with chronic illness. Recent findings suggest patient interactions within such systems are associated with patient outcomes. To evaluate the relationship between level of patients' depression and spouse psychosocial status, 55 couples of whom one was on hemodialysis were interviewed.²⁰ The spouses' levels of depressive affect correlated directly with the patients' depression scores. A significant 2-way interaction for spousal depression (patient's depression and spousal support) supported viewing spouses' adjustment as a function of the interaction between spouse and patient factors. Additionally, a main effect of perceived spousal social support on spousal marital satisfaction indicated that spouses reporting high levels of social support had the least marital strain. The severity of the patient's illness did not correlate with any of the predictor variables or measures of spousal adjustment, but spouses reported significantly lower functional

status for patients than did nephrologists. Spouse and patient levels of depression are related, although causal relationships cannot be determined by these studies. Moreover, spouse perception of marital satisfaction is related to depression scores. Spouse psychosocial status could impact on the level of patient's depression, and the spouse might be amenable to interventions that could improve patient outcome.

The change in family functioning of families involved with ESRD partly is related to the patient's spouses with high psychological distress and impaired adjustment.²⁹ This changed adjustment of the family members includes using more optimistic and palliative coping, but less confrontative, self-reliant, and evasive and emotive and fatalistic copings.²⁹ These may be the cause of low quality of lives of the spouses of patients with ESRD in several life areas,³⁰ which is reportedly even poorer in the spouses than the patients.³¹

Having a supportive family environment is considered important for patients with ESRD as a part of quality of life and social support, and affects their perception of illness and medical situation, such as adherence to fluid intake restrictions, and even overall survival.^{32,33} Such effects of marital relationship, however, have been attributed to the effect on neuroendocrine or immunologic status by some authors; the most believed mechanism is the impact of degree of conflict on health-related behaviors of the patients.³²

In our study, marital relationship quality in patients maintained on hemodialysis was linked with depressive symptoms, and to lesser degree with anxiety symptoms. In the psychological studies, there is evidence in agreement with the correlation of depression (than anxiety) with marital satisfaction in patients with ESRD,³² and this can be also observed in the general population.³⁴ Unsatisfactory marital relationship may place a member of the couple at greater risk of psychological problems, because a relationship troubled with the disease may be the source of stress, while at the same time preventing the attainment of social support outside the context of the marital relationship.³⁵

Preventive strategies for poor marital relationship are designed as established programs. Behaviorally oriented skills-based marriage preparation programs can lead to behavioral changes that may help prevent the emergence of marital dysfunction.³⁶

A significant improvement in marital adjustment after treatment of depression is reported previously. This should be always considered that poor marital adjustment is a predictor of difficulty in treatment of depression.³⁷

To address our limitations, low sample size of our study should be mentioned. As well, not including some marital and ESRD-related variables to the study may be another limitation. It should be also mentioned that correlation coefficients between psychological symptoms and marital relationship quality were not so strong, and several other variables may have also a role in their relation, which should be considered in our future research.

CONCLUSIONS

The condition of marital adjustment in patients on hemodialysis is poorer compared to the healthy controls. This problem is more dominant in men, younger patients, and those with higher education levels. Depression and anxiety, the latter of which being more frequent in patients on dialysis, can make marital adjustment worse and lead to a vicious circle of poor quality of life for both the patient and the spouse. These findings show the necessity of an appropriate family approach for patients on long-term dialysis.

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CONFLICT OF INTEREST

None declared.

REFERENCES

1. [No authors listed]. Constitution of the World Health Organization. 1946. Bull World Health Organ. 2002;80:983-4.
2. Luk WS. The HRQoL of renal transplant patients. J Clin Nurs. 2004;13:201-9.
3. Waltz M. Marital context and post-infarction quality of life: is it social support or something more? Soc Sci Med. 1986;22:791-805.
4. Burns DD, Sayers SL, Moras K. Intimate relationships and depression: is there a causal connection? J Consult Clin Psychol. 1994;62:1033-43.
5. Muehrer RJ, Becker BN. Life after transplantation: new transitions in quality of life and psychological distress. Semin Dial. 2005;18:124-31.
6. Laffel LM, Vangness L, Connell A, Goebel-Fabbri A, Butler D, Anderson BJ. Impact of ambulatory, family-

- focused teamwork intervention on glycemic control in youth with type 1 diabetes. *J Pediatr*. 2003;142:409-16.
7. Trief PM, Wade MJ, Britton KD, Weinstock RS. A prospective analysis of marital relationship factors and quality of life in diabetes. *Diabetes Care*. 2002;25:1154-8.
 8. Wicks MN, Milstead EJ, Hathaway DK, Cetingok M. Subjective burden and quality of life in family caregivers of patients with end stage renal disease. *ANNA J*. 1997;24:527-8, 31-8.
 9. Shimoyama S, Hirakawa O, Yahiro K, et al. Health-related quality of life and caregiver burden among peritoneal dialysis patients and their family caregivers in Japan. *Perit Dial Int*. 2003;23:s200-5.
 10. Pelletier-Hibbert M, Sohi P. Sources of uncertainty and coping strategies used by family members of individuals living with end stage renal disease. *Nephrol Nurs J*. 2001;28:411-7, 9.
 11. Ziegert K, Fridlund B, Lidell E. Health in everyday life among spouses of haemodialysis patients: a content analysis. *Scand J Caring Sci*. 2006;20:223-8.
 12. Ziegert K, Fridlund B. Conceptions of life situation among next-of-kin of haemodialysis patients. *J Nurs Manag*. 2001;9:231-9.
 13. Wellard SJ, Street AF. Family issues in home-based care. *Int J Nurs Pract*. 1999;5:132-6.
 14. White N, Richter J, Koeckeritz J, Munch K, Walter P. 'Going forward': family resiliency in patients on hemodialysis. *J Fam Nurs*. 2004;10:357-78.
 15. Luk WS. The home care experience as perceived by the caregivers of Chinese dialysis patients. *Int J Nurs Stud*. 2002;39:269-77.
 16. Ekelund ML, Westman K, Andersson SI. Dialysis-linked complaints and burdens of illness on patient and spouse as predictors of survival in end-stage renal disease patients with home hemodialysis: a 10-year follow-up study. *Stress Health*. 2004;20:29-34.
 17. Fathi-Ashtiani A, Karami GR, Einollahi B, et al. Marital quality in kidney transplant recipients: easy to predict, hard to neglect. *Transplant Proc*. 2007;39:1085-7.
 18. Nouhi S, Tavallaie SA, Abadi Farahani MA, Assari SH, Einollahi B. Does end stage renal disease or type of renal replacement therapy affect marital relationship in diabetics? a preliminary report. *Int J Endocrinol Metab*. 2007;3:123-9.
 19. Einollahi B, Tavallaii SA, Bahaeloo-Horeh S, Omranifard V, Salehi-Rad S, Khoddami-Vishteh HR. Marital relationship and its correlates in kidney recipients. *Psychol Health Med*. 2009;14:162-9.
 20. Daneker B, Kimmel PL, Ranich T, Peterson RA. Depression and marital dissatisfaction in patients with end-stage renal disease and in their spouses. *Am J Kidney Dis*. 2001;38:839-46.
 21. Busby DM, Christensen C, Crane RD, Larson J H. A revision of the Dyadic Adjustment Scale for use with distressed and non-distressed couples: construct hierarchy and multidimensional scales. *J Marital Fam Ther*. 1995;21:289-308.
 22. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatr Scand*. 1983;67:361-70.
 23. Ifudu O, Paul HR, Homel P, Friedman EA. Predictive value of functional status for mortality in patients on maintenance hemodialysis. *Am J Nephrol*. 1998;18:109-16.
 24. Karaminia R, Tavallaii SA, Lorgard-Dezfuli-Nejad M, et al. Anxiety and depression: a comparison between renal transplant recipients and hemodialysis patients. *Transplant Proc*. 2007;39:1082-4.
 25. Noohi S, Khaghani-Zadeh M, Javadipour M, et al. Anxiety and depression are correlated with higher morbidity after kidney transplantation. *Transplant Proc*. 2007;39:1074-8.
 26. Low J, Smith G, Burns A, Jones L. The impact of end stage kidney disease (ESKD) on close persons: A literature review. *NKT Plus*. 2008;2:67-79.
 27. Auer J. Dialysis—a family matter. A personal tribute to the relatives of kidney patients. *Edtna Erca J*. 2002;28:141-4.
 28. Binik YM, Chowanec GD, Devins GM. Marital role strain, illness intrusiveness, and their impact on marital and individual adjustment in end-stage renal disease. *Psychol Health*. 1990;4:245-7.
 29. Soskolne V, Kaplan De-Nour A. The psychosocial adjustment of patients and spouses to dialysis treatment. *Soc Sci Med*. 1989;29:497-502.
 30. Gray H, Brogan D, Kutner NG. Status of life-areas: congruence/noncongruence in ESRD patient and spouse perceptions. *Soc Sci Med*. 1985;20:341-6.
 31. Dunn SA, Lewis SL, Bonner PN, Meize-Grochowski R. Quality of life for spouses of CAPD patients. *ANNA J*. 1994;21:237-46, 57.
 32. Kimmel PL, Peterson RA, Weihs KL, et al. Dyadic relationship conflict, gender, and mortality in urban hemodialysis patients. *J Am Soc Nephrol*. 2000;11:1518-25.
 33. Turner-Musa J, Leidner D, Simmens S, Reiss D, Kimmel PL, Holder B. Family structure and patient survival in an African-American end-stage renal disease population: a preliminary investigation. *Soc Sci Med*. 1999;48:1333-40.
 34. Kiecolt-Glaser JK, Fisher LD, Ogrocki P, Stout JC, Speicher CE, Glaser R. Marital quality, marital disruption, and immune function. *Psychosom Med*. 1987;49:13-34.
 35. Bloom BL, Asher SJ, White SW. Marital disruption as a stressor: a review and analysis. *Psychol Bull*. 1978;85:867-94.
 36. Sayers SL, Kohn CS, Heavey C. Prevention of marital dysfunction: behavioral approaches and beyond. *Clin Psychol Rev*. 1998;18:713-44.
 37. Whisman MA. Marital adjustment and outcome following treatments for depression. *J Consult Clin Psychol*. 2001;69:125-9.

Correspondence to:
Seyed Abbas Tavallaii, MD
PO Box: 14155-6437, Tehran, Iran
Tel: +98 21 8126 4150
Fax: +98 21 8126 4150
E-mail: cru_common@yahoo.com

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