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3. Kuczmarski RJ, Ogden CL, Grammer-Strawn LM, Flegal KM, Guo SS, Wei R, et al. CDC growth charts: United States. Advance data from vital and health statistics. No. 314. Hyattsville, Md: National Center for Health Statistics, 2000. (DHHS publication no. (PHS) 2000-1250 0-0431)

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Chronic Diseases Journal

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Evaluation of the status of antibiotic prescription in patients admitted to a teaching hospital in west of Iran

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Original Article

Abstract

BACKGROUND: The aim of this study was to evaluate the status of the appropriate use of antibiotics by type, dosage, and length of treatment and the route of administration in Tohid teaching hospital, Sanandaj, Iran.

METHODS: In a retrospective descriptive study, 400 patients were systematically selected from patients receiving antibiotics hospitalized in Tohid hospital from March 2016 to March 2017. Demographic characteristics, hospitalization ward, diagnosis, antibiotic prescribed, dosage, length of treatment, the route of administration, and prescribing physician were recorded. The treatments were compared with standard treatment based on Harrison reference. The data were analyzed using STATA software.

RESULTS: Out of total patients, 54% were men and 46% were women with a mean age of 57.87 ± 9.87 years. The mean duration of hospitalization was 6.37 ± 2.69 days. More and less numbers of patients were admitted in the internal medicine ward (23.75%) and intensive care unit (ICU) (1.00%), respectively, The highest antibiotics were administered by internal medicine specialists (40.25%), the most commonly prescribed antibiotic was ceftriaxone (34.59%), and the most common cause of antibiotic therapy was pneumonia (20.50%). Out of 595 antibiotics prescribed, 28.50% of the administrations were inappropriate. In addition, the objective for the prescription of the first and second antibiotic was inappropriate in 27.50% and 33.70% of cases, respectively. Dosage, route of administration, and the length of treatment of the prescribed antibiotic was inappropriate in 9.00%, 0.50%, and 41.00% of cases, respectively. The highest and lowest rate of inappropriate antibiotic prescription was observed in surgical (51.31%) and infectious diseases (12.90%) wards.

CONCLUSION: Due to the increase inappropriate administration of antibiotics, it is necessary to train the specialists about the planning, appropriate medical consultations for antibiotic therapy, and limitation of the new antibiotics prescription.

KEYWORDS: Antibiotic, Prescription, Patients

Date of submission: 22 Mar. 2016, ***Date of acceptance:*** 03 Sep. 2016

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Introduction

Antibiotics are of the important advances made by the modern medicine, and proper use of them has resulted in a significant reduction in mortality.[1] Patients who are hospitalized in the new era are older than the patients hospitalized a decade ago, and have a poorer immunity status which makes them more

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susceptible to bacterial infections; thus they are more in need of antibiotics.[1,2] The use of antibiotics in hospitals is increasing.[3] Antibiotics are the second most commonly used drugs in the America and Europe, and 60-90% of hospitalized patients receive antibiotics while 40% of these cases have no proper laboratory confirmation and indications. Inappropriate prescription is more common in surgical wards than in medical wards.[4,5] According to Amane and Kop study, 75% of cases of antibiotic prescription in the surgical ward were inappropriate.[6]

Antibiotics are the most common type of drug purchased and used by patients in developing countries, and 44-97% of the patients receive antibiotics while a considerable part of these prescriptions are unnecessary and inappropriate; these countries have poor control over the use of antibiotics.[7,8] According to some studies, the use of antibiotics have increased by 40% over few years.[9] Studies have shown that the use of antibiotics in Iran is about 2-4 times more than that in European and American countries; the majority of inappropriate antibiotics are prescribed for treating upper respiratory tract infections.[8,10] Inappropriate antibiotic prescription mainly includes inappropriate combination therapy, inappropriate dosage of medication, inappropriate duration of treatment, inappropriate antibiotic prophylaxis, inadequate tissue penetration of prescribed antibiotic, drug interactions, and inappropriate pattern of prescription. Inappropriate and excessive prescription of antibiotics is associated with increased drug resistance and the emergence of multi-drug resistant (MDR) organisms.[10]

Given the above-mentioned facts, nowadays the antibiotic-resistant nosocomial infections have become a global concern; because they are associated with increased mortality, increased length of hospital stay, increased costs, increased need for expensive antibiotics, and increased use of protective equipment such as gown and gloves.[3,11] The aim of this study was to evaluate the status of appropriate use of antibiotics by type, dosage, length of treatment and the route of administration in Tohid teaching hospital, Sanandaj, Iran.

Materials and Methods

This retrospective descriptive study carried out on patients hospitalized in the Tohid teaching hospital from March 2016 to March 2017, who were under antibiotic therapy. Study protocol was approved by the Ethics Committee of Kurdistan University of Medical Sciences, Iran. Based on the principles of Helsinki Declaration, all aspects of protecting personal data of the participants were considered by the researchers.

Systematic random sampling was done and considering a ratio of 50% for each dependent variable, and confidence interval of 5%, 400 patients with a history of at least one antibiotic intake presenting to the mentioned hospital, were included. No age limitation was set for the participants. Patients with incomplete medical profiles, unavailable data, and unknown history were excluded.

With the aid of a pre-designed checklist, demographic data, and baseline characteristics (hospitalization ward, diagnosis, Duration of hospitalization, antibiotic prescribed, and physician) of the patients were obtained from the patient medical records. Outcome measures of inappropriate antibiotic prescribing were determined based on the type of drug, dosage, route of administration, and length of treatment by the physician depending on the disease, severity of the disease, and conditions of the patient. All of data were gathered by a medical student; then, the extracted data were reviewed by three infectious disease specialists. The treatments were compared with standard treatment based on Harrison's textbook.[12]

Finally, the extracted data were entered into Stata software (Version 11, StataCorp, College

Station, TX, USA) and were analyzed using descriptive statistics. In addition, the results were presented in tables and the percentages and confidence intervals were calculated.

Results

The mean age of the patients was 57.70 ± 9.87 years, and the mean duration of hospitalization was 6.37 ± 2.69 days.

More and less numbers of the patients were admitted to internal medicine ward (23.75%) and intensive care unit (ICU) (1.00%), respectively. The highest number of antibiotics was prescribed by specialists (42.75%); in addition, internal medicine specialists were the largest group of specialists prescribing antibiotics (40.25%). Pneumonia was the most common diagnosed condition which led to antibiotic prescription (20.50%), and diabetic foot ulcer and cellulitis were the least common infectious diseases which led to antibiotic prescription (1.00%) (Table1).

The most commonly used antibiotics were ceftriaxone (34.59%) and ciprofloxacin (23.06%), respectively (Table 2).

28.50% of the total 678 cases of antibiotics prescribed for treatment and prophylaxis were inappropriate. The objective for the prescription of the first and second antibiotic was inappropriate in 27.50%, and 33.70% of cases, respectively. The dosage, route of administration, and the length of treatment of the prescribed antibiotic was inappropriate in 9.00%, 0.50%, and 41.00% of cases, respectively. The highest and lowest rate of inappropriate antibiotic prescription was observed in surgical (51.31%) and infectious diseases (12.90%) wards, respectively (Table 3).

Discussion

Inappropriate prescription of antibiotics (in terms of dosage, duration, and type of medication) can increase health care costs, complications, length of hospital stay, and the incidence of drug resistance.[13-15]

Table 1. Number of patients receiving antibiotics, by ward, physician admitting, and diagnosis of the disease

Variable		Frequency (%)
Ward	Intensive care unit (ICU)	4 (1.00)
	Internal	95 (23.75)
	Infectious diseases	31 (7.75)
	Heart diseases	72 (18.00)
	Neurology	24 (6.00)
	Gastrointestinal diseases	30 (7.50)
	pulmonary diseases	34 (8.50)
	Oncology	37 (9.25)
	Surgery	33 (8.25)
	Urology	40 (10.00)
Physician	General practitioner	3 (0.75)
	Intern	63 (15.75)
	Resident	134 (33.50)
	Specialist	171 (42.75)
	Subspecialist	29 (7.25)
Type of specialty	Internist	161 (40.25)
	Cardiologist	45 (11.25)
	Infectious disease specialist	18 (4.50)
	Surgeon	32 (8.00)
	Nephrologist	2 (0.50)
	Endocrinologist	1 (0.25)
	Gastroenterologist	6 (1.50)
	Oncologists	17 (4.25)
	Urologist	40 (10.00)
	Neurologist	13 (3.25)
	No specialty	65 (16.25)
Diagnosed disease	Urinary tract infection (UTI)	55 (13.75)
	Pneumonia	82 (20.50)
	Deep vein thrombosis (DVT)	10 (2.50)
	Asthma	8 (2.00)
	Brucellosis	8 (2.00)
	Weakness and fatigue	10 (2.50)
	Gastroenteritis (GE)	16 (4.00)
	Cellulitis	4 (1.00)
	Sepsis	17 (4.25)
	Diabetic foot ulcers	4 (1.00)
	Abdominal pain	13 (3.25)
	Cancer	20 (5.00)
	Acute coronary syndrome (ACS)	6 (1.50)
	Chronic obstructive pulmonary disease (COPD)	7 (1.75)
	Colorectal diseases	6 (1.50)
	Urinary tract diseases	27 (6.75)
	Other	106 (26.50)

Table 2. The most frequently prescribed antibiotics

Type of antibiotic	Frequency (%)
Ceftriaxone	138 (34.59)
Azithromycin	26 (6.52)
Cefazolin	51 (12.78)
Cefepime	1 (0.25)
Metronidazole	11 (2.76)
Ciprofloxacin	92 (23.06)
Clindamycin	9 (2.25)
Vancomycin	12 (3.01)
Meropenem	16 (4.01)
Imipenem	15 (3.76)
Cloxacillin	4 (1.00)
Levofloxacin	1 (0.25)
Rifampin	3 (0.75)
Gentamicin	11 (2.76)
Cotrimoxazole	1 (0.25)
Cefixime	3 (0.75)
Cefotaxime	2 (0.50)
Doxycycline	1 (0.25)
Ampicillin	1 (0.25)
Ampibactam	1 (0.25)

Based on various studies, the prevalence of inappropriate prescription of antibiotics is 50%, which even can reach 75% in surgical wards.[16,17] Hence, currently the World Health Organization (WHO) and other health organization in the United States of America and some other countries have focused their policies on appropriate prescription and use of antibiotics, and made it a health priority.[18] Nowadays, several studies are being conducted in this field to determine the status of antibiotic prescription in every country, and design some plans to improve the trends.

In Rajalingam et al. study, the mean age of the studied patients was 49.25 ± 20.69 years, and the mean duration of hospital stay was 7.5 ± 4.18 days.[13] Hence, our studied subjects had a shorter length of hospital stay (6.37 ± 2.69 days), and greater mean age (57.70 ± 9.87 years). The shorter length of stay which was observed in our study could be justified because the studied hospital was a general hospital; in addition, patients undergoing surgery usually have a shorter length of hospital stay. Considering that the mean age of people is increasing with the passage of time, it is normal to observe patients of older ages.

One of the methods used in antibiotic therapy is to add new antibiotics to the previous drug regimen. In Rajalingam et al. study, about 30% of the patients received two types of antibiotics simultaneously.[13] In our study, with adding the second antibiotics to the drug regimen, the rate of errors and inappropriate prescriptions increased. This reflects the fact that by adding new antibiotics to the previous regime, the risk of error increases.

One of the reasons is that the majority of specialists in the fields of noninfectious diseases (especially in internal medicine which account for the majority of hospitalization and antibiotics prescriptions) have better knowledge in the initial selection or choice of drug;

Table 3. Frequency of appropriate type of antibiotic therapy by department

Objective for the antibiotic prescription	Department [Frequency (%)]			
	Internal	Infectious diseases	Surgery	Total
Treatment	146 (49.32)	27 (87.10)	9 (12.33)	182
Prophylaxis	3 (1.01)	0 (0)	37 (50.68)	40
unknown Indication	65 (21.96)	0 (0)	4 (5.48)	69
Inappropriate antibiotic administration	82 (27.70)	4 (12.90)	23 (51.31)	109
Total	296	31	73	400

however, when there is a need for more complicated treatments, or when facing drug resistance which makes it necessary to prescribe more complicated antibiotic regimens, the condition becomes more difficult to manage, and it will become necessary to ask for expert advice. Therefore, when facing a complex case of disease or facing drug resistance, it is essential to ask for advice from people who are expert in antibiotic therapy, and prevent random prescription of antibiotics.

In our study, overall in 28.57% of cases of antibiotic had been prescribed inappropriately. In a study by Hecker et al., in 30% of cases the prescription was inappropriate,[16] and in a study by Alavi Moghaddam et al., 54% of cases of antibiotic prescription was inappropriate, and 40.2% of all cases with indication had received inappropriate dose or type of antibiotic.[17]

In a study by Ayuthya et al., 26% of cases of antibiotic prescription were inappropriate.[18] In other studies, the rate of inappropriate prescription was 61%,[19] 32.3%,[14] 46.7,[20] 23%,[21] and 54%.[17] Considering the results of this study and other studies, clearly there is a serious problem in this area and the majority of the health centers are faced with the problem. In some cases, even when there is an indication for the prescription of antibiotics, the dosage or type of prescribed antibiotic are inappropriate.

In our study, internal medicine ward had the largest share in the use of antibiotics (23.75%); however, the surgical ward has the largest share in inappropriate use of antibiotics (51.31%). In Raveh et al. study, 65.2% of the patients were admitted to internal medicine ward, and 64 ± 13 percent received antibiotics. The least amount of antibiotic prescription was observed in neonatal intensive care unit (NICU). Among all the wards evaluated in their study, emergency ward and NICU had the largest rate of appropriate antibiotic prescription (94%). However, the largest rate of inappropriate antibiotic prescription was observed in surgical wards.[2] In Tunger et al. study, the rate of appropriate prescription of antibiotics was 46% in internal medicine ward, and 10% in gynecology ward.[5] The largest rate of inappropriate prescription was observed in surgical ward (89.5%), and the lowest rate of inappropriate prescription was observed in the infectious diseases ward (56.8%) in Gangwar et al. study.[11] The results of most of the mentioned studies are in line with the results of our study. The majority of the patients are admitted to internal medicine ward; as the patients admitted to this ward are different and have various internal problems, the high rate of inappropriate prescription in this ward can be justified. Given the above-mentioned facts, the majority of training programs and plannings must be directed toward internal medicine ward (because of the large number of patients admitted to this ward), and surgical ward (because of the large prevalence of inappropriate prescription of antibiotics).

Considering the type of antibiotic, based on the results of our study, the most commonly used antibiotics were ceftriaxone (34.59%) and ciprofloxacin (23.06%), respectively. In studies by Rajalingam et al.,[13] and Alavi Moghaddam et al.,[17] cephalosporin was the most commonly used drug, while in Amane and Kop study,[6] fluoroquinolones (norfloxacin) was ranked first among the prescribed antibiotics; the results of all the three mentioned studies are consistent with the results of our study. The above-mentioned reports indicate widespread and inappropriate use of fluoroquinolones and cephalosporins. Since urinary and respiratory tract infections are the most common reasons for starting antibiotics, the above-mentioned findings can be justified; because both of these drugs are among the list of first line therapy of respiratory and urinary tract infections.

Conclusion

Inappropriate antibiotic prescription is

currently a serious problem, and even it can be said that it is an emergency condition. The errors in antibiotic prescription are associated with its different dimensions, and in addition to inappropriate choice of antibiotic, the error may be related to inappropriate dosage, length of treatment, route of administration, combination therapy, and some other items. Surgical wards are more prone to inappropriate prescription of antibiotics. The current condition may be improved via making serious efforts to train and re-train the medical staffs, receiving proper and on-time expert advice, limiting the prescription of new antibiotics, and assigning some specialists to prescribe antibiotics.

Conflict of Interests

Authors have no conflict of interests.

Acknowledgments

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Correlation between the changes of Klotho protein with calcium and phosphate concentrations in the serum at early stages of multiple sclerosis

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Original Article

Abstract

BACKGROUND: There are several studies indicating that an anti-aging protein, namely Klotho protein, participates in the regulation of calcium and phosphate metabolism. In addition, we showed that Klotho protein was involved in the pathogenesis of multiple sclerosis (MS). Hence, we hypothesized that Klotho protein changes in patients with multiple sclerosis might lead to alteration of calcium and phosphate metabolism. Accordingly, the aim of the present study was to evaluate the alteration of calcium and phosphate levels together with the concentration of Klotho protein in the serum of patients with multiple sclerosis.

METHODS: In this case-control study, 14 patients with newly diagnosed relapsing-remitting multiple sclerosis (RRMS) along with 14 control individuals with noninflammatory neurological disorders were enrolled. The serum concentrations of Klotho protein, calcium, and phosphate were measured in serum of participants using commercial kits. The data were analyzed at the significant level of $P < 0.050$.

RESULTS: There were no significant changes in serum concentrations of Klotho protein, and phosphate in patients with multiple sclerosis when compared to controls. However, the serum calcium concentration was significantly lower than the control group. Regarding patients with multiple sclerosis, there was a significant positive correlation between changes in serum concentrations of Klotho protein and calcium ($r = 0.604$, $P = 0.022$), whereas the other correlations were not statistically significant.

CONCLUSION: To our knowledge, this is the first study demonstrating a positive correlation between serum concentrations of secretory Klotho protein and calcium in patients with multiple sclerosis.

KEYWORDS: Klotho Protein, Calcium, Phosphorus, Multiple Sclerosis

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Introduction

There are several studies indicating that an anti-aging protein, namely Klotho protein, participates in the regulation of vitamin D, calcium, and phosphate metabolism.[1,2] Klotho protein is highly expressed in the kidneys and choroid plexus of brain. The secretory Klotho protein in the plasma comes mainly from kidneys, and in the cerebrospinal fluid (CSF) derives from choroid plexus.[1,3] It has been reported that transmembrane form of Klotho protein acts as a co-receptor for fibroblast

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growth factor receptors (FGFRs). In fact, transmembrane form of Klotho protein in the kidneys increases the affinity of FGFRs toward fibroblast growth factor 23 (FGF 23). FGF 23 downregulates vitamin D biosynthesis and increases phosphate excretion from the kidneys.[4] In addition, the secretory form of Klotho protein in kidney can increase the stability of potassium [such as renal outer medullary potassium channel-1 (ROMK1)] and calcium channels [such as Transient receptor potential cation channel subfamily V member 5 (TRPV5)] which leads to calcium retention in the human body. Furthermore, secretory Klotho protein increases phosphate excretion from kidneys through sodium-phosphate co-transporters [such as type II sodium-dependent phosphate co-transporter a (Npt2a].[5]

Recently, we showed that Klotho protein may participate in the pathogenesis of multiple sclerosis (MS).[6-8] We found that secretory form of Klotho protein decreased in the CSF of patients with MS when compared to control individuals,[6] while serum Klotho protein concentration was comparable to control group at early stages of MS.[7] We hypothesized that Klotho protein changes in patients with MS may lead to alteration of calcium and phosphate metabolism. Accordingly, the aim of the present study was to evaluate the changes of calcium and phosphate levels along with Klotho protein concentration in the serum of individuals with newly diagnosed MS.

Materials and Methods

This case-control study was the continuation of our previous works which were established at the Department of Neurology, Imam Khomeini hospital, Tehran, Iran.[6-8] This study was approved by the Ethics Committee of Tehran University of Medical Sciences (ECTUMS; ethical code# 92-04-30-25660). In addition, informed consent was obtained from all the participants.

Altogether, 28 individuals were recruited in this study. Fourteen patients were selected among patients who definitely diagnosed for the first time (new cases) as having active relapsing-remitting MS (RRMS) using the revised McDonald's criteria,[9] and thus had no experience of receiving immunomodulatory drugs or supplementation. The remaining patients, comprised of 14 individuals with non-inflammatory neurological diseases as a control group. The inclusion/exclusion criteria for the present study have been described before.[6]

Demographic and clinical data were obtained. Serum samples were collected. The concentration of Klotho protein was determined using a commercial enzyme-linked immunosorbent assay (ELISA) kit with high accuracy and precision (human soluble α-Klotho protein assay kit, IBL Co., Japan, Code No. 27998 and Lot No. 1L-303). Furthermore, serum levels of calcium and phosphate were assayed on an auto-analyzer instrument (Hitachi 917, Tokyo, Japan) using available kits (Pars Azmoon Co; Tehran, Iran).

Data analysis was performed using GraphPad Prism software (version 6.01, GraphPad Software, La Jolla, CA, USA). Data were presented as mean ± standard deviation (SD). Comparison between the groups was performed using independent-samples t test. The chi-square test was applied in order to compare the sex distribution between the case and control groups. The significance was considered as less than 0.05 ($P < 0.050$).

Results

As indicated in table 1, the case and control groups were good sex- and age-matched. There were no significant changes in serum concentrations of Klotho protein and phosphate in patients with MS when compared to controls ($P > 0.050$).

Among the patients with MS, serum calcium concentration was significantly lower than the control group ($P = 0.028$).

Regarding the patients with MS, there was a significant positive correlation between the changes in serum concentrations of Klotho protein and calcium ($r = 0.604$, $P = 0.022$), whereas the other correlations were not statistically significant ($P > 0.050$ for all).

Table 1. Demographic, clinical and biochemical data of control individuals and multiple sclerosis (MS) patients

	Control individuals (n = 14)	MS patients (n = 14)	Statistical test (P)
Gender (Female/Male ratio)	12/2	12/2	Chi-square test (P = 1.000)
Age (year) (mean ± SD)	33.28 ± 14.14	28.07 ± 8.54	Independent-samples t-test (P = 0.249)
Duration of disease	---	newly diagnosed patients	---
EDSS (mean; range of scores)	---	2.85; 1.5-4.5	---
Serum Klotho protein concentration (mean ± SD)	552.23 (pg/ml) ± 123.54	587.43(pg/ml) ± 159.63	Independent-samples t-test (P = 0.520)
Serum calcium concentration (mean ± SD)	10.51 (mg/dl) ± 0.70	9.90 (mg/dl) ± 0.67*	Independent-samples t-test (P = 0.028)
Serum phosphate concentration (mean ± SD)	4.06 (mg/dl) ± 0.71	3.73 (mg/dl) ± 0.53	Independent-samples t-test (P = 0.168)

EDSS: Stands for expanded disability status scale; MS: Multiple sclerosis; SD: Standard deviation; * means significantly different from control group ($P < 0.05$)

Discussion

The results of the present study showed that serum calcium concentration decreased in patients with MS. This result corroborates the finding of Ellidag et al.,[10] but contradicts their results regarding serum concentrations of phosphate and Klotho protein. In the present study, patients were new cases, while they enrolled patients with prolonged disease duration.

Ellidag et al.,[10] indicated that serum Klotho protein and phosphate were elevated in patients with MS, whereas we previously showed that serum Klotho protein concentration increased in patients with prolonged MS duration.[7] This contradictory results may be attributed to the duration of the disease regarding Klotho protein expression as a time-dependent factor. Interestingly, we found a significant positive correlation between Klotho protein changes and calcium level in the serum of patients with MS.

Conclusion

It is plausible to speculate that secretory Klotho protein is involved in the homeostasis of serum calcium concentration in patients with MS.

Conflict of Interests

Authors have no conflict of interests.

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Evaluation of epidemiologic, clinical, and paraclinical features of children with brucellosis hospitalized in two teaching hospital related to Mazandaran University of Medical Sciences, Iran, during the years 2010-2016

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Original Article

Abstract

BACKGROUND: The clinical manifestations of brucellosis are very diverse. This study was conducted to investigate the epidemiological, laboratory, and clinical characteristics in pediatrics patients with brucellosis.

METHODS: In this descriptive cross-sectional study, the population included patients under age of 18 years who were hospitalized with a diagnosis of brucellosis in Razi hospital, Qaemshahr City, and Bu-ali Sina hospital, Sari City, Iran, during the years 2010-2016. Twenty seven patients with a mean age of 12.5 years including 9 girls and 18 boys had inclusion criteria and entered to study. Most patients (70.3%) were in the age range of 12-18 years.

RESULTS: Twenty one patients (77.8%) consumed unpasteurized dairy products and 10 patients (37%) had direct contact with livestock. Most of the initial complaints were fever in 13 cases (48.1%), joint pain in 12 cases (44.4%), and limbs pain in 5 cases (18.5%). The most common clinical findings were arthritis (14.8%) and splenomegaly (7.4%). In laboratory findings, 11.1% had leukopenia, 48.1% had anemia, 3.7% had thrombocytopenia, 29.6% had a moderate increase in erythrocyte sedimentation rate (ESR), 25.9% had high increase in ESR, and 18.5% had leukocytosis. Clinical signs and laboratory parameters in the study included chills and fever, joints and limbs pain, arthritis, splenomegaly, increase in ESR, anemia, leukocytosis, and leukopenia.

CONCLUSION: In patients with fever and skeletal or joints pain, brucellosis should be considered as a possible disease, and initial diagnostic measures should be taken, especially in children. Signs and symptoms of brucellosis are various and nonspecific. Educating the high risk families plays an important role in management of disease.

KEYWORDS: Brucellosis, Pediatrics, Epidemiology, Clinical Medicine

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Introduction

Brucellosis is a common disease between humans and animals (the most common disease, commonly seen in wild and domestic animals). Although brucellosis is eradicated in some countries and is controlled in some others, it remains a threat to human health in areas such as Mexico, South and Central

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America, the Mediterranean region, the Arabian Peninsula, Iran, and the Indian subcontinent. Today, 8 species of brucellosis have been identified of which four species have moderate to severe pathogenicity: Brucella melitensis (B. melitensis), Brucella abortus, Brucella canis, and Brucella suis. B. melitensis is the main cause of human brucellosis in Iran. In endemic areas, especially when B. melitensis is common, children over 25% of cases develop human brucellosis.[1]

This bacterium is transmitted from animal to human through the use of contaminated food, direct contact with an infected animal, or aerosol inhaling. Brucella can enter the human body through skin damage, mucous membranes, conjunctiva, as well as respiratory and digestive tract. The main route for oral transmission is the unpasteurized milk. Workers at slaughterhouses, farmers and shepherds, veterinarians and microbiologists are at the risk of brucellosis contamination.[2] The etiologic agent of the disease is a gram-negative coccobacilli that is mobile, without spore production and oxidative metabolism, and does not grow in normal culture media. Brucella attacks both phagocytic and non-phagocytic cells (that is unique in this regard), and can survive in the intracellular environment and escape the immune system.[3]

Brucella can be inserted into the lymph system, the kidneys, spleen, breast tissue, or joints; it can give local or systemic involvement and cause a wide range of clinical symptoms. Almost all body systems can be involved in the disease.[2] Fever and chills, and joint pain are major symptoms of brucellosis in children. Sweating, anorexia, weight loss, low back pain, headache and general weakness are also symptoms of brucellosis, especially in children. The risk of brucellosis should be considered when confronting with these symptoms, especially in hyperendemic areas. The disease incubation period is one to three weeks, but it can also be several months. Brucellosis symptoms can range from a subclinical infection to a chronic disease. If clinical symptoms take more than 12 months, it is considered to be chronic, mostly due to the presence of deep infectious sites such as areas of pus in the bones, joints, liver, spleen, and kidneys.[4,5]

The most common focal manifestations are musculoskeletal pain, septic arthritis, and knee, hip, sacroiliac, shoulder, sternocellular joints involvement in the form of monoarthritis or polyarthritis.[6] Objective criteria are useful for assessing the probability of brucellosis, including clinical signs and serologic tests. The best way to treat brucellosis is prevention and proper use of dairy products and other animal products.[6]

In clinical examinations, fever and lymphadenopathy are more common symptoms. Arthritis is the most common localized complication of brucellosis. In children, single-knee joint as well as sacroiliac and hip joints involvement are more common.[4,5] Peripheral blood tests usually do not recognize the disease or even may be misleading. The number of white blood cells (WBC) usually affects the lymphocytosis. In general, Wright's titer increases in most patients with acute brucellosis within 1-2 weeks, and changes in serum will occur in almost all patients within three weeks after the onset of the disease. The change in the Wright test head is considered to be valuable and significant when increased by a factor of four or more, and when the initial titer is at least 1/40 or greater, and then increases to 1/160 or more, in other words, the titer 1/160 is considered positive. Most referrals have a headline greater than or equal to 1/160 in non-endemic regions and a headline of 1/320 in endemic regions, but in Iran's protocol for brucellosis, the titer 1/80 for Coombs Wright test and 1/40 for 2 mercaptoethanol (2 ME) are considered positive.[7]

Considering the prevalence of brucellosis in

Iran and its endemic as well as different clinical manifestations, it is possible to study the incidence of the disease with clinical and laboratory manifestations in this regions; early diagnosis and treatment of the disease can reduce its complications, especially among children. Considering the above issues, this research was conducted to study the epidemiological characteristics, clinical signs, and laboratory findings in patients. Finally, the statistics can be compared with the results of other studies in Iran and other parts of the world.

Materials and Methods

The aim of this case study was to evaluate patients with positive clinical signs of brucellosis and Wright titer equal to or greater than 1/80 who were hospitalized in infectious or pediatric wards of Razi hospital in Qaemshahr City, and Bou-ali Sina hospital in Sari City, Iran, two teaching hospital related to Mazandaran University of Medical Sciences, during the years 2010-2016. The study population was patients under the age of 18 with diagnosis of brucellosis whose records were available in the hospitals.

The exclusion criteria were lack of confirmation of Brucellosis. For data collection, information form was used and the variables like gender, clinical symptoms, and hematologic findings such as WBC, platelets (PLT), hemoglobin (Hb), red blood cells (RBC), etc were extracted from the files. Anemia was a decrease in hemoglobin rate to below 11.5 g/dl. Leukopenia was associated with a decrease in WBC to less than 4,500 µg/µl, while leukocytosis was in the form of an increase in WBC more than 10,000 µg/µl; thrombocytopenia included a decrease in the number of PLT to less than 150,000 µg/µl. Aspartate aminotransferase (AST) outside the range of 5 to 40 units per liter of serum, alanine transaminase (ALT) outside the range of 7 to 56 units per liter, and alkaline phosphatase (ALP) greater than or equal to 350 units per liter of serum were reported abnormal. The normal erythrocyte sedimentation rate (ESR) value was 25 mm/hour, according to that the patients were divided into three groups: patients with ESR in the range of 0-25, patients with ESR in the range of 25-50 (average increase), and patients with ESR value above 50 mm/hour which indicated a sharp increase.

After collecting information, the data were entered into SPSS software (version 17, SPSS Inc., Chicago, IL, USA) and analyzed using descriptive statistics. Generally, on the basis of clinical evidence based on laboratory tests and according to Wright's national protocol, titer of 1/80 and 2 ME with a titer of 1/40 were considered positive, and the patients should be examined for clinical, epidemiological, and laboratory characteristics.

Results

The range of patients' age was between 13 to 17 years and the average age was 12.5 years. 4 cases (14.8%) in the age group of 0-6 years, 4 cases (14.8%) in the group of 6-12 years , and 19 cases (70.3%) in the group of 12-18 years old, diagnosed with brucellosis were selected for the study. Of the 27 patients under study, 18 cases (66.7%) were boys and 9 cases (33.3%) were girls. Of the total patients, 16 cases (59.3%) were rural residents and 11 cases (40.7%) were urban residents. The number of visits in different seasons was as 8 cases (29.6%) in the spring, 12 cases (44.4%) in the summer, 4 cases (14.8%) in the fall, and 3 cases (11.1%) in the winter. 21 cases (77.8%) had a history of local and non-pasteurized dairy consumption, while 6 people (22.2%) did not have history of local dairy consumption.

According to the information obtained from the questionnaire, 10 cases (37%) had a history of direct contact with the livestock, while 17 cases (63%) did not have such a record. Among the main complaints mentioned in the

questionnaire (fever, chills, stroke, lameness, limb pain, joint pain, headache, and swelling), the most common complaint was fever. 13 patients (48.1%) reported fever as their main problem, while in 4 cases (14.8%) chills, in 12 cases (44.4%) joint pain, in 4 cases (14.8%) limping, in 5 cases (18.5%) limb pain, in 1 case (3.7%) headache, and in 1 patient (3.7%) joint swelling were the main complaints of the patients.

The most common symptom was fever, which included 22 cases (81.5%) of the patients. Chills was observed in 10 cases (37%), sweating in 12 cases (44.4%), headache in 5 cases (18.5%), nausea in 7 cases (25.9%), vomiting in 4 cases (14.8%), abdominal pain in 2 cases (7.4%), anorexia in (10%), weight loss in 9 cases (33.3%), myalgia in 12 cases (44.4%), arthralgia in 18 cases (66.7%), low back pain in 4 cases (14.8%), weakness and lethargy in 7 cases (25.9%), and limping in 8 cases (29.6%). Other findings were as arthritis in 4 cases (14.8%), splenomegaly in 2 cases (7.4%), hepatomegaly in 1 case (3.7%), and lymphadenopathy in 1 case (3.7%). There was no orchitis in any of the patients.

Anemia was observed in 48% of patients (hemoglobin < 11.5 g/dl). Moreover, 11% of patients had leukopenia (WBC < 4500 per µl) and 18.5% of patients had leukocytosis. Platelets (PTL) was within the normal range (150,000-400,000 per µl) in most patients (88.8%). The highest ESR values were within the range of 0-25 mm/hour, which was defined in the normal range. Subsequently, ESR was increased by 33.3% (25-50mm/hour). According to liver function tests, AST was in the abnormal range in 22.2% of the cases, ALT was abnormal in 14.4% of patients, and ALP increased in 40.7% of cases. The liver can be involved in brucellosis as the largest organ of the reticuloendothelial system, but most cases of hepatitis are subclinical and will not interfere with laboratory tests. In the case of liver biopsy, in these cases, hepatitis is reported in most patients.

Discussion

This study was carried out to determine the epidemiological, clinical and laboratory characteristics of brucellosis in children admitted in two teaching hospital related to Mazandaran University of Medical Sciences during the years 2010-2016. In terms of gender distribution, 66.7% were boys and 33.3% were girls, which could be due to more occupational or non-occupational exposure, which is higher in boys at that age, and has been the same in other studies; considering the fact that boys have more contact with animals compared to girls and also use more unsafe foods.[8,9]

The majority of patients in this study were in the age group of 12-18 years, and the average age was 12.5 years. This contrasts with the study of Fanni et al., with nearly half of the patients aged 2 to 5 years.[10] Moreover, in the study of Tanir et al. in Turkey,[12] and Giannakopoulos et al. in Greece,[8] only 18% of patients were under the age of 5 years; due to the fact that in the present study most of the children were living in rural areas and had inevitable contacts with the livestock, which increased the possibility of pediatric exposure at this age, while in Fanni et al. study, most children were infected through contaminated dairy products,[10] which is more likely to be used at lower ages and infancy period.

In this study, 40.7% and 59.3% of patients were urban and rural residents, respectively; which shows that dairy pasteurization in rural areas is still not well. In addition, 77.8% had a history of local dairy consumption, while 22.2% had no history of using non-pasteurized dairy products. However, it was found that other ways of transmitting disease from animals to humans included inhalation of aerosols and contamination through scratches and cuts in the surface of the skin. However, the high percentage of local dairy use in this study and other studies suggests that

consumption of contaminated dairy products is still the main route for transmission of disease. In the study by Aghaali et al., only 29% had local dairy consumption.[11] According to the results most patients (63%) of the present study did not have contact with the livestock. This indicates that although contact with the livestock is a risk factor, in its absence, other symptoms and findings, especially in endemic areas, should be noted. In the study by Aghaali et al., livestock exposure was found in only 17% of patients.[11]

Most cases of disease were observed in the spring and summer seasons, which could be due to traveling to the rural areas in these seasons, and also due to the consumption of local dairy products.[12] However, in adults, the incidence of this disease in spring and winter is higher, due to the coincidence with breastfeeding.[13-17] In this case, the result of this study is similar to that of others. In endemic areas, family history of brucellosis, the use of non-pasteurized dairy products or contact with pets may lead physicians to research and detect brucellosis in obese children.

In this study, none of the patients had a positive family history of brucellosis; but in the study of pediatric brucellosis in northeastern Iran in 2012, 91.6% had a history of brucellosis in the family.[13] The most common complaint was fever (48.1%), followed by joint pain (44.4%). Therefore, in each patient, joint treatment should be considered, especially in endemic brucellosis areas, except for one of the main differential diagnoses. In a study by Armin et al., all children diagnosed with brucellosis during 1996-2005 were studied in one of the largest children's hospitals in Tehran, Iran; similar to other studies, fever and arthralgia were the most common complaints. The most common clinical signs and symptoms were fever (81.5%), arthralgia (66.7%), sweating and myalgia (44.4%), weight loss and appetite decrease (37% and 33.3%), followed by lameness (29.6%), anxiety and nausea (25.9%), headache (18.5%), back pain and vomiting both (14.8%), and abdominal pain (7.4%).[16] In other studies, more common symptoms such as sweating, headache, abdominal pain and weight loss were reported.[12,18-22]

Arthritis was most commonly found in the present study (14.8%). After that, splenomegaly with 7.4%, and hepatomegaly and lymphadenopathy with 3.7% were mostly observed. In the study of Fanni et al.[10] and Sawadkohi et al.[23] the most common findings were arthritis and splenomegaly. Brucella species involve the reticuloendothelial system, and organomyelagia is often found in the examination, but this wide range of reports may be due to the experience of examiners, the quality of the physical examination, and the duration of the disease.[9]

In the present study, skin rash and orchitis were not observed in any of the patients, while in the study of Fanni et al., maculopupular rash was found in patients.[10] In laboratory studies of the present research anemia was seen as the most common laboratory finding in 48% of patients, which includes one-third of the patients. In the study of Fanni et al. anemia, leukopenia, and thrombocytopenia were the most common laboratory findings.[10] In addition, 11% of patients had leukopenia (WBC < 4500 per µl) and 18.5% had leukocytosis (18.5%); in most patients (70%) WBC was within the normal range (4500-10000 µl) and the majority of patients (88.8%) had platelet count in the normal range (150,000-400,000). In the study of Fanni et al., only one case had leukocytosis, 33% had leukopenia and 12% had thrombocytopenia.[10]

The highest ESR values were in the abnormal range, 29.6% increase in average and 25.9% increase in severity. In terms of AST liver function tests, 22.2% of cases were in abnormal range, 14.8% of cases were abnormal in terms of ALT, and 40.7% had ALP increase. In another study by Yoldas et al., ALT has

been reported above 200 IU/l in 90 brucellosis cases, and in 1 case AST has been reported above 200 IU/l, with 40% AST above 40 IU/l and 34% ALT over 40 IU/l.[9]

Many of the patients who referred to the hospital's clinic and diagnosed with brucellosis were not admitted to hospital and were treated out patiently, and therefore excluded from this study. Moreover, the time was relatively limited. Other limitations were the incompleteness of files and their illegibility, especially in laboratory information and inquiries. Indications and clinical symptoms in this study included fever and chills, joint pain, limb pain, lameness, as well as arthritis and splenomegaly. Besides, Hb and ESR values were within the abnormal range (often increasing by definition), and leukocytosis was the most common site of sacrum involvement.

Conclusion

Due to the endemic nature of Mazandaran area in terms of brucellosis, familiarity with those signs and findings of the disease that are more prevalent will be useful in faster diagnosis and treatment. Moreover, in any illness with fever and nonspecific symptoms such as sweating, weight and appetite loss, weakness and lethargy as well as skeletal complaints, it is important to consider brucellosis as an important differential diagnosis.

Conflict of Interests

Authors have no conflict of interests.

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The relationship between the adequacy of hemodialysis and laboratory parameters

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Original Article

Abstract

BACKGROUND: The present study was conducted in order to evaluate the factors affecting the adequacy of dialysis and determine the relationship of dialysis adequacy with laboratory parameters.

METHODS: This descriptive study was performed on 60 hemodialysis patients of Razi Medical Center of Qaemshahr, Iran, with the history of more than 3 months of dialysis. The participants were selected using census method. Data collection was conducted through a researcher-made questionnaire. Blood samples were collected to evaluate laboratory parameters. The adequacy of dialysis was calculated through the Kt/V parameter. The obtained data were analyzed using descriptive statistical tests.

RESULTS: According to the Kt/V criteria, the mean dialysis adequacy index was 1.6 ± 0.22 and 41.7% of the patients had the optimum dialysis adequacy (Kt/V of greater than 1.2), and 43.3% of patients had a dialysis adequacy which was close to the desirable level. There was a significant reverse relationship between dialysis adequacy and alkaline phosphatase (ALP), blood sugar, and body mass index (BMI). Nevertheless, there was no significant relationship between dialysis adequacy and parathyroid hormone (PTH), cholesterol, triglycerides, alanine aminotransferase (ALT), aspartate aminotransferase (AST), calcium, phosphorus, and the number of dialysis sessions per week, duration of each dialysis session, and the history of dialysis (P > 0.050).

CONCLUSION: In order to increase the adequacy of dialysis, the blood sugar level of patients should be controlled and patients should be advised to modify their weight using a suitable diet.

KEYWORDS: Dialysis, Hemodialysis, Enzymes

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Introduction

Hemodialysis is the most commonly utilized treatment in individuals with end-stage renal disease (ESRD).[1]

Inadequacy of hemodialysis is one of the chief causes of morbidity and mortality in patients with ESRD. High Kt/V is one of the main objectives of hemodialysis and has a significant effect on the prognosis of patients undergoing dialysis; therefore, the factors affecting it must be carefully controlled and monitored.[2] According to reliable sources, Kt/V of less than 0.8 is considered as a sign of inadequacy.[3]

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Given the facilities and limitations of dialysis beds in the country, it is essential to maintain the sufficient adequacy of dialysis in patients by medical interventions.[4] Since more efficientdialysis will improve the patients' status and their life expectancy with fewer side effects, it is very important to identify the factors affecting the adequacy of dialysis and how to increase its efficiency.[5]

In the case of dysfunctional hemodialysis, the patient will require higher frequency or duration of hemodialysis, which not only has additional treatment costs for the healthcare system of the country, but also has the risk of transmission of fatal infectious agents, such as hepatitis B and C, and HIV and other blood-borne infections. These issues illustrate the need for performing more effective hemodialysis.[5,6]

Desirable dialysis can improve quality of life (QOL) and increase life expectancy of patients. In addition, blood urea nitrogen (BUN) and creatinine (Cr) are short-term predictors of patients' condition and cannot show the condition of chronic dialysis patients. Thus, the present study was conducted to determine the relationship between the adequacy of hemodialysis and laboratory parameters in patients undergoing hemodialysis at Razi Hospital of Qaemshahr City, Mazandaran Province, Iran.

Materials and Methods

The present cross-sectional study was performed on 60 patients undergoing hemodialysis at Razi Hospital of Qaemshahr City. Inclusion criteria were the history of dialysis of more than 3 months (steadily) in this medical center, having an arteriovenous fistula, efficient shunt, being fully conscious, mental health, and the lack of emergency hemodialysis. Cases of death, traveling, or unwillingness to participate in the study were excluded. The research population included 74 patients on hemodialysis permanently in this center, of which 60 cases remained after the implementation of the exclusion criteria. The samples were selected through census and based on moral considerations. A researcher-made checklist was used to collect data on age, sex, height, dry weight, blood pressure, onset of dialysis, hemodialysis duration, number of dialysis per week, duration of dialysis each session, the period between 2 dialysis sessions, weight, Cr and BUN before and after the first session of dialysis, pre-dialysis weight before the second session, hemoglobin (Hb), hematocrit (Ht), blood type, filter type, type of dialyzer, and history of kidney transplant. The validity of the checklist was determined using content validity; this means that it was given to a number of experts in this field and their final opinions were applied.

The demographic and clinical data were obtained through interviews and observations. The blood pressure, height, and weight of patients (in a hospital gown and no shoes) were measured before dialysis. Blood samples were collected and sent to the laboratory before the first dialysis session, to measure BUN, Cr, Hb, Ht, sodium, potassium, parathyroid hormone (PTH), blood glucose, alkaline phosphatase (ALP), cholesterol, triglycerides, alanine aminotransferase (ALT), and aspartate aminotransferase (AST) and determine blood disorders. It should be mentioned that for sample preparation before dialysis, after the dialysis needles attached, blood samples were obtained from the arterial line, and it was attempted to carefully maintain heparin or normal saline in the arterial line before sampling. Evaluation of the characteristics of the dialysis machine during the dialysis performed observationally. At the end of dialysis, to avoid re-circulation of blood samples, 2 cc of blood clots was obtained using low flow speed method to evaluate BUN after dialysis. Thus, 2 minutes before sampling, the machine was set on 50 ml/minute, and after 30 seconds, samples were taken. Samples were collected from the arterial line (Seth) (above the dialyzer), since the

differences between arterial-venous urea concentration is low at the time. Blood samples were sent to the laboratory, and after receiving the test results, urea fraction ratio formula was used to calculate the reduction of blood urea, and logarithmic Daugirdas 2 formula was used to evaluate the adequacy of dialysis. After the dialysis, patient's weight and blood pressure were controlled.

It is noteworthy that blood samples for testing BUN, Cr, Hb, and Ht were immediately sent to the laboratory only in the morning shift and were measured by one of the employees of the laboratory. Blood tests were performed using an autoanalyzer (Elitekits, France) at Razi Hospital.

The collected data were analyzed using descriptive (mean and standard deviation) and inferential statistics (correlation and chi-square), with confidence level of 0.95 and test power of 0.80 in SPSS software (version 16, SPSS Inc., Chicago, IL, USA). The Kt/V level was calculated based on the logarithmic Daugirdas 2 formula:

$$Kt/V = IN (R-0.008t) + (4-3/5R) + UF/W$$

In which IN is the negative natural logarithm, R is BUN after dialysis divided by BUN before dialysis, T is time of dialysis in hours, UF is weight loss in kilograms during dialysis, and W is weight in kilograms after dialysis. In addition, urea reduction ratio (URR) is obtained through the following equation.

$$URR = 100 \times 1 - (\text{pre-dialysis urea}/\text{post-dialysis urea}).$$

Results

In this study, 60 patients were eligible to participate, of which 31 were women and 29 men. Their age range was 21 to 91 years with a mean age of 59.5 ± 16.5 years. Moreover, 58.3, 47.4, 29.8, 74.6, and 35.3 percent were, respectively, illiterate, housekeepers, self-employed, married, and residents of urban areas and 46.7% had blood type O+. In addition, 96.7% of the subjects had a history of kidney transplant, 3.8% had a history of smoking, 80% of patients had dialysis for 4 hours in each session, and 76.7% of subjects had dialysis 3 times a week. Filter type in 30% and 25% of cases was R60 and PS10, respectively (Table 1).

The mean onset of dialysis was 10.3 ± 7.5 months. The mean dialysis adequacy index based on the Kt/V criteria was 1.6 ± 0.2. The results showed that according to the Kt/V criteria, 42.4% of the patients had the optimum dialysis adequacy; this means that Kt/V of greater than 1.2% and 44.1% were close to the desirable level.

The mean Kt/V in female patients was 1.8 ± 0.3 and in men 1.5 ± 0.2; according to independent t-test, this difference was statistically significant ($P < 0.001$).

Based on Pearson's correlation coefficient, there was no statistically significant relationship between the number of dialysis sessions per week, history of dialysis, and dialysis duration in each session and Kt/v ($P > 0.050$). According to independent t-test, there was no statistically significant relationship between age and Kt/v ($P > 0.050$).

Among the subjects, 57.6% had normal body mass index (BMI), 30.5% were overweight, and 10.2% had BMI of less than normal.

The mean and SD of BMI among the subjects was 23.1 ± 3.7 kg/m^2 and it was in the range of 17.7-34.9. Based on Pearson's correlation coefficient, there was a statistically significant inverse relationship between BMI and adequacy of dialysis session ($P < 0.001$ and $r = -0.466$). In people who had a BMI of higher than normal, the dialysis adequacy was lower.

Mean and SD of PTH was 209.7 ± 246.1 pg/ml and it ranged between 0.1373 and 4. Based on Pearson's correlation coefficient, a significant relationship was observed between dialysis adequacy and PTH ($P > 0.050$).

The mean and SD of AST was 18.7 ± 6.9 IU/l and it ranged between 8 and 38. The mean and SD of ALT was 16.7 ± 8.1 IU/l and it ranged between 6 and 45.

Table 1. Frequency distribution of demographic and clinical information of patients

Variables		Frequency (%)
Gender	Female	31 (51.7)
	Male	29 (48.3)
Marital status	Single	6 (10.2)
	Married	44 (74.6)
	Divorced	8 (13.6)
	Widowed	1 (1.7)
Education level	Illiterate	35 (58.7)
	Secondary school	10 (16.7)
	Diploma	9 (15.0)
	University	6 (10.0)
Occupation	Housekeeper	27 (47.4)
	Employee	3 (5.3)
	Retired	8 (14.0)
	Unemployed	1 (1.8)
	Self-employed	17 (29.8)
	Student	1 (1.8)
Area of residence	Urban	32 (53.3)
	Rural	28 (46.7)
History of kidney transplant	Yes	1 (1.7)
	No	58 (98.3)
Type of dialysis filter	ps10	15 (25.0)
	R70	8 (13.3)
	PS13	17 (28.3)
	R60	18 (30.0)
	R80	2 (3.3)
Diet	Uremic	41 (68.3)
	Diabetic-uremic	14 (23.7)
	Diabetic-uremic-salting	2 (3.4)
	Uremic-salting	2 (3.4)
Number of dialysis sessions in a week	2	9 (15.0)
	3	46 (76.7)
	4	5 (8.3)
Duration of dialysis each session (hour)	3	1 (1.7)
	3.4	3 (5.0)
	3.5	8 (13.3)
	4	48 (80.0)
Blood type	A+	15 (25.0)
	O+	28 (46.7)
	AB+	3 (5.0)
	B+	8 (13.3)
	A-	3 (5.0)
	O-	2 (3.3)
	AB-	1 (1.7)
History of smoking	Yes	2 (3.8)
	No	51 (96.2)
Adequacy of dialysis	Favorable (greater than 1.2)	25 (42.4)
	Relatively favorable (1.2 to 0.8)	26 (44.1)
	Unfavorable (less than 0.8)	8 (13.6)

In addition, the mean and SD of ALP was 375.6 ± 233.6 IU/l and it ranged between 118 and 1490. Based on Pearson's correlation coefficient, dialysis adequacy had a significant negative correlation with ALP enzymes (P = 0.023, r = -. 296); those who had lower ALP, had a better dialysis adequacy.

Based on Pearson's correlation coefficient, there was no statistically significant relationship between dialysis adequacy and AST and ALT enzymes (P > 0.050). Furthermore, 60% of participants had fetal bovine serum (FBS) of higher than normal.

Mean and SD of FBS was 133.4 ± 54.8 mg/dl and it ranged between 50 and 319. Based on Pearson's correlation coefficient, there was a significant negative correlation between FBS and dialysis adequacy (P = 0.005, r = -0.357).

Mean and SD of cholesterol was 144.2 ± 38.4 mg/dl and it ranged between 50 and 245. The mean and SD of triglyceride was 170.6 ± 110.8 mg/dl. Based on Pearson's correlation coefficient, cholesterol and triglycerides had a significant relationship with dialysis adequacy (P > 0.050).

Mean and SD of calcium was 61.8 ± 48.1 mg/dl and it ranged between 1.90 and 11.50. The mean and SD of phosphorus was 6.5 ± 6.0 mg/dl and it ranged between of 2 and 54. Besides, the mean and SD of sodium was 139.1 ± 3.7 mg/dl and it ranged between 130 and 148. Moreover, the mean and SD of potassium was 4.5 ± 0.8 mg/dl and it ranged between 3 and 7.40 (Table 2).

Based on Pearson's correlation coefficient, there was no statistically significant relationship between the amount of calcium, phosphorus, sodium, and potassium and dialysis adequacy (P > 0.050).

The average Hb and Ht, ferritin, total iron-binding capacity (TIBC), and serum iron in patients were 10.97 g/dl, 34.61%, 272.6 ng/ml, 460.6 ng/ml, and 102.03 mg/dl, respectively. Based on Pearson's correlation coefficient, the adequacy of dialysis did not have a significant relationship with Hb, Ht, ferritin, serum iron, and TIBC (P > 0.050).

HIV Ab and HBsAg in all samples were negative. However, hepatitis C virus (HCV) Ab was negative in 96.7% and positive in 3.3% of subjects.

Table 2: laboratory findings and their relationship with dialysis adequacy

Laboratory criteria	Mean ± SD	Minimum	Maximum	P
FBS (mg/dl)	54.78 ± 133.41	50.0	319.0	0.005
TIBC (ng/ml)	272.56 ± 58.51	35.0	408.0	0.650
Ferritin (ng/ml)	460.57 ± 313.36	25.0	1000.0	0.600
Serum Iron (mg/dl)	102.03 ± 68.78	37.0	450.0	0.330
Hb (g/dl)	10.97 ± 2.31	6.0	18.2	0.310
Ht (%)	34.61 ± 6.50	20.4	54.3	0.140
TG (mg/ml)	170.57 ± 110.78	30.3	600.0	0.450
Cholesterol (mg/dl)	144.18 ± 38.38	50.0	245.0	0.290
PTH (pg/dl)	209.76 ± 246.10	4.0	1373.0	0.660
AST (IU/l)	18.70 ± 6.89	8.0	38.0	0.240
ALT (IU/l)	16.73 ± 8.12	6.0	45.0	0.730
ALP (IU/l)	375.61 ± 233.57	118.0	1490.0	0.023
Ca (mg/dl)	8.61 ± 1.48	1.9	11.5	0.370
P (mg/dl)	6.00 ± 6.53	2.0	54.0	0.310
Na (mg/dl)	139.10 ± 3.75	130.0	148.0	0.840
K (mg/dl)	4.49 ± 0.81	3.0	7.4	0.700
Albumin (g/dl)	4.21 ± 0.81	2.1	6.0	0.620

FBS: Fetal bovine serum; TIBC: total iron-binding capacity; Hb: Hemoglobin; Ht: Hematocrit; TG: Thyroglobulin; PTH: Parathyroid hormone; AST: Aspartate aminotransferase; ALT: Alanine aminotransferase; ALP: Alkaline phosphatase; Ca: Calcium; P: Phosphorus; Na: Sodium; K: Potassium

Discussion

In this study, the mean dialysis adequacy index based on the Kt/V criteria was 1.6 ± 0.22, and URR was 60.81 ± 10.73. Furthermore, 41.7% of patients had the optimum dialysis adequacy (Kt/V of greater than 1.2) and 20% had URR of greater than 65%.

The results of the study by Tayyebi et al. on the adequacy of dialysis showed that half of the patients (50.5%) had desirable dialysis adequacy (Kt/V of greater than 1.2) and only 46% had a URR of 65% (6) that is in agreement with the results of the current study.[7]

In the study of Mogharab et al. on hemodialysis patients at the Educational Hospital of Birjand, Iran, the average Kt/V was 1.17, and in 70% of the patients, Kt/V was between 0.9 and 1.3.[4] Moreover, the average URR was 62.8, and in 66% of patients, it ranged between 61% and 70%, and the adequacy of dialysis was relatively desirable.[4]

In the study of Hojjat on the adequacy of dialysis, the mean Kt/V was 0.93, which is a sign of low adequacy of dialysis.[3]

In this study, 46.7%, 25%, and 13.3% of the participants were O+ ,A+, B+ blood type, respectively. In the study of Tayyebi et al., the majority of patients (43%) were A+ and the least number were AB^+ (5%).[7]

In the present study, 2 patients had positive anti-HCV and its prevalence was 3.3%, and HIV Ab and HBsAg were negative in all samples.

Joukar et al. conducted a study on the genotype of hepatitis C virus in hemodialysis patients with hepatitis C in Gilan Province, Iran.[8] The results showed that from among 514 patients undergoing hemodialysis in the whole province, 61 patients had positive anti-HCV and its prevalence was reported as 11.9%.[8]

Khoushbaten et al. conducted a study on the prevalence of antibodies against hepatitis E in patients undergoing hemodialysis in Tabriz, Iran. They found that the average duration of hemodialysis was 37.7 months and total seroprevalence of hepatitis E was 7.4%. They also found that 4.6% of patients were HBsAg positive and 20.4% were HCV Ab positive. Moreover, they found that demographic variables did not have a significant relationship with blood-borne viral infections among patients with hepatitis E.[9]

In this study, there was no statistically significant relationship between the adequacy of dialysis and PTH, calcium, phosphorus, sodium, and potassium.

Mousavi Movahed et al. conducted a study on the amount of calcium, phosphorus, and PTH and their relationship with calcification of heart valves in patients undergoing hemodialysis.[10] The results showed that the amount of PTH had a significant relationship with calcification of heart valves. Nevertheless, the amount of calcium and phosphorus, diabetes, hypertension, hyperlipidemia, the product of calcium-phosphorus, and duration of dialysis showed no significant association with calcification of heart valves.[10]

In the present study, adequacy of dialysis was found to have a statistically significant reverse relationship with ALP enzymes; those who had lower ALP also had better dialysis adequacy. However, no statistically significant relationship was observed between the adequacy of dialysis and AST and ALT enzymes.

In this study, the amount of cholesterol and triglycerides did not have a significant relationship with the adequacy of dialysis. Moreover, the amount of Cr and BUN was significantly reduced after dialysis compared to their pre-dialysis amount and showed a statistically significant difference.

In this study, of the 60 patients eligible for the research, 31 were women and 29 men. The mean Kt/V of women was higher than men, and there was a statistically significant relationship between sex and Kt/V. This is likely due to the similar dialysis filter in both sexes, which resulted in a better dialysis for women due to the smaller size, less weight, and distribution of urea.

In the study of Mogharab et al., 68% of patients were men, and a statistically significant difference was observed between men and women in terms of Kt/V and dialysis adequacy.[4] In the study of Hojjat, 64.7% of patients were men, and dialysis quality had a significant relationship with gender.[3] These results are consistent with that of the present study. However, in the study of Raeisifar et al. on 45 patients, 25 were women, and there was no statistically significant relationship between gender and dialysis adequacy.[11] In the studies of Monfared et al.[12] and Tayyebi et al.,[7] the adequacy of dialysis had no statistically significant relationship with gender.

In this study, the mean age of patients was 59.55 ± 16.47 years and there was no statistically significant relationship between age and Kt/V ($P > 0.050$). In the study of Raeisifar et al., the mean age of the participants was 53.5, and there was no statistically significant relationship between age and dialysis adequacy.[11] In the study of Mogharab et al., the mean age of patients was 47.70 ± 16.72 years, and there was no statistically significant relationship between age and Kt/V.[4] Furthermore, in the study of Monfared et al., no statistically significant relationship was found between age and dialysis adequacy.[12] These results were consistent with that of the present study. Nevertheless, the overall mean age of patients in this study was higher.

In the present study, the association between BMI of patients and Kt/V was statistically significant. The mean BMI of the subjects was 23.10 ± 3.74 kg/m^2, which is in the normal range (20-25). This can be effective on improving dialysis adequacy, because a BMI of less than 20 indicates malnutrition, blood urea reduction due to reduced protein intake, and decreased metabolism.

In this study, 61.7% of patients had Hb of less than 11 g/dl and the mean Hb, Ht, ferritin, and TIBC in patients were 10.97 g/dl, 34.61%, 460.57 ng/ml, and 272.56 ng/ml, respectively. However, dialysis adequacy did not have a statistically significant relationship with Hb, Ht, ferritin, and TIBC ($P > 0.050$)

Considering the high prevalence of anemia in patients undergoing hemodialysis, blood loss should be prevented during dialysis procedures and nutrition advice should be provided by an expert.

In this study, there was no statistically significant relationship between serum albumin and dialysis adequacy. However, in the study of Monfared et al.,[12] serum albumin levels were significantly related to the adequacy of hemodialysis; those who had undesirable dialysis adequacy were adversely affected by hypoalbuminemia.[4] The difference with this study can be due to almost normal serum albumin levels in all units of the study.

Mean and SD of PTH was 209.76 ± 246.10 pg/dl. No significant relationship was observed between dialysis adequacy and PTH. In addition, there was no statistically significant relationship between PTH, alkaline phosphatase, Hb, and Ht. The results of the study by Baradaran et al. on the role of secondary hyperparathyroidism on anemia of patients with ESRD undergoing hemodialysis showed that PTH and alkaline phosphatase levels had an inverse correlation with Hb and Ht.[13]

The average fasting blood sugar in the participants of this study was 133.41 mg/dl. A significant inverse relationship was observed between dialysis adequacy and fasting blood sugar; those who had high blood sugar experienced lower dialysis adequacy.

In the present study, 80% of patients experienced 4 hours of dialysis each session and 76.7% of subjects underwent dialysis 3 times a week. In the study of Mogharab et al., 88% of subjects experienced 4 hours of dialysis each session and 62% underwent dialysis 3 times a week.[4]

In this study, the mean Kt/V of patients who underwent dialysis 3 times per week was higher than those who underwent dialysis

twice a week. This finding is in agreement with that of Mogharab et al.[4] It seems that through revising the strategy intended for patients on dialysis and changing their plans from 2 times to 3 times a week their dialysis adequacy can be increased.

In the present study, the majority of subjects were illiterates (58.3%), and this should be considered by health personnel in providing the required training for patients.

Mogharab et al. found that dialysis adequacy had a significant relationship with the number of dialysis sessions per week, BMI, and average blood pump.[4] Nevertheless, the relationship of age and duration of dialysis sessions with dialysis adequacy during dialysis sessions was not significant.[8] Zerati et al. conducted a study on the factors affecting dialysis adequacy in patients undergoing hemodialysis. The results showed that the most important factor in dialysis adequacy was the insufficient dose of dialysis.[14]

The results of the study by Tayyebi et al. on the relationship between blood pressure and dialysis adequacy in patients undergoing hemodialysis showed a significant association between blood pressure and the dialysis adequacy indices of URR and Kt/V.[7] The results of the study by Roozitalab et al. on the adequacy of dialysis in patients undergoing hemodialysis showed a statistically significant difference in BUN before and after dialysis.[15] In the study of Hojjat, there was a statistically significant difference in blood pressure, weight, BUN, and Cr before and after the dialysis session.[3]

Conclusion

Based on the above mentioned issues, the overall results of Kt/V and URR showed the favorable and acceptable quantity and quality of dialysis. According to studies carried out in Iran in the field of dialysis adequacy, there are different levels of inadequate dialysis in each center.

Therefore, it is necessary to determine the cause of this inadequacy in all patients, and then, take the necessary steps to improve dialysis adequacy, and in turn, increase the QOL of dialysis patients. It is also necessary to calculate dialysis dose specifically for each individual, and dialysis time should be prescribed based on patients' needs. Moreover, filters compatible with the patient's body must be used. In addition, since the lack of cooperation in patients is the leading cause of shorter time of dialysis or its cancellation, the necessary trainings should be provided regarding the prescribed time for dialysis, timely visits, and appropriate diet.

Conflict of Interests

Authors have no conflict of interests.

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Analysis of the concept of family-centered care in chronic diseases: Rodgers's evolutionary approach

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Review Article

Abstract

BACKGROUND: Considering the fact that hospitalization of a family member in the intensive care unit (ICU) can have a great impact on different aspects of the life of the patient's family, the purpose of this study was to clarify the concept of family-centered care with chronic diseases admitted to ICU.

METHODS: In this study, Rodgers' evolutionary concept approach was used to analyze the concept of family-centered care for chronic patients. Criteria for entering articles, books and scientific information in English and Persian from 1980 to 2016 on family-based care and chronic diseases were selected using scientific databases.

RESULTS: Family-based care in chronic diseases is a concept that process nature with care management, education and interaction. Also, three types of forerunners here include family-related predictions (family efficiency), self-confidence (system-related), adequate resources, social factors and cultural factors (related to care providers), participation (in this case).

CONCLUSION: The concept of family-centered care has evolved over the past few years in relation to chronic diseases. Nurses have significantly improved their knowledge of family care mainly focusing on improving the families of patients. Therefore, the nurses in the care groups have been significantly influenced and have been able to assume the responsibility of family-based care groups.

KEYWORDS: Proof of Concept Study, Concept Formation, Family-Centered Nursing, Chronic Illness

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Introduction

Each year, many families experience the admission of one of their beloved to the hospital because of chronic diseases in the intensive care unit (ICU). Hospitalization in these areas potentially has a tangible and terrible conception for the patient and family and poses many problems that avoidance of their negative effects is unavoidable.[1] Hospitalization in special care units and lack of communication with the family create mental and physical stress for the patient and the family,[2] and constrains people for excessive or inadequate sensory stimulation (ISS).[3] Fear of losing one of the family members, fear of the future, fear of financial burden of disease on the family, changes in family roles, anxiety and distress, depression, loneliness and discomfort are among the threats posed by hospitalization which can affect the integrated family system.[4]

In most cases, ICU patients are not able to participate in decision-making for therapeutic purposes, and in half of the cases، this decision is taken by family members.[5] These threats and stress, along with a lack of awareness, can significantly reduce the ability to decide for medical purposes, as well as the interaction

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between the family and the treatment team.[6] In the long-term period, it can cause many physiologic and psychological illnesses.[7] The needs of patients admitted to the ICU and their families have been studied in many papers. Patients' presence alongside their families and vice versa and participation in patient care have been introduced as one of the essential requirements.[8] Providing information, support, reliability, comfort and convenience for the patient and family are among other needs for both groups.[9] Moreover, the studies indicate that providing family's support and information are required in the hospital environment, especially in ICU during the treatment of the patient. Knowing the treatment plan, teaching the family and using their participation are among the most important needs. It associates the educational-related support of nursing staff especially during the care of the patient.[10]

In this regard, one of the ways of empowerment of the patient's family is the implementation of family-based care, in which a close relationship is established between the staff and the family of the patient.[11] In such a space, not only the patient, but also the family and health personnel will benefit from it.[12] In fact, most families tend to take part in all aspects of caring for a patient and often have this partnership for themselves. Also, the presence and participation of the family is beneficial to the patient and promotes the improvement and reduction of the complications of the disease and decreases the patient's hospitalization days. On the other hand, the presence and participation of the family in the care of the patient will strengthen the family relationship and reduce the negative effects of the disease in the family.[13] Because the most effective services are those that emphasize the role of the family in treatment.[14]

Family-based care is a health care approach that shapes health philosophies, plans, ease of care and plans, daily interactions with patients, families, and doctors and other health workers.[15] In the family-based care system, the emphasis is placed on the patient and the family, and the family function is considered in terms of the role of all members not merely as a member of the family's patient. In principle, participation in care is based on the values and beliefs of the family.[12]

In family-based care, the nurse and members of the health-care team empower and strengthen the family by providing opportunities for one-family members to demonstrate their capacities and abilities to provide and respond to patient needs.[16] Nurse's duties in providing family-based care, interaction with family members and the ability to make positive changes in the family, utilize the power of each individual member.[17] With the continuity of this relationship, the family plays a fundamental and positive role in deciding on the most important and decisive affairs.[18]

The nurse's role in this field is not to interfere and influence the decision-making process of the family, but to support them and actualize potential abilities to promote the evolution of the members.[19] Research has shown that supporting the family, giving information and training them will make them feel control and power on their own positions and take more care of their patients.[20]

Although the patient's needs are very important during admission, it is also necessary to pay attention to the needs of the patient's family. They, indeed, can take care and support from the patient when they have a piece of mind.[21] Studies have shown that nursing-family interactive care model can be a suitable practical guide for interactive care by nurses and parents in view of the increasing trend of therapeutic services from a therapist-based approach. In this model, all decision-making and plans in the intervention are directed at the family-centered service.[22]

Concepts create the components of theories, and there is a need for concepts to form a theory to evolve.[23] To advance each discipline, expansion, development, and evolution of the concept are of particular importance. In nursing, approaches and strategies are used to develop concepts.[24] The analysis of the concept is the basis of the theory and is one of the effective processes for the evaluation, development of the theory and knowledge of nursing.[22] Many of the basic concepts of nursing have not been clearly analyzed in the analysis of previously-defined concepts. Therefore, the analysis of the concepts leads to thinking about a good concept, in which the attempts are made to determine and interpret the logical and psychological dimensions of the concepts. Conceptual analysis not only emphasizes definitions and meanings of concepts but also discusses their development.[25]

In nursing science, the concept of analysis is a prerequisite for the development and evolution of research. On the other hand, we need to use concept analysis if we want to develop nursing science through research and scientific and rational development. In analyzing the concept, the principle of originality and inductive method is used to clarify the meanings. Conceptual analysis leads to the consensus meanings of nursing, knowledge, development, and progress in nursing.[26]

Rodgers' evolutionary analysis approach focuses on their concepts and their function in spreading knowledge. In the Rodgers' evolutionary perspective, concepts are inductive, spin, and step-by-step to evolve. Also, in this approach, the meanings of concepts are not constant. Progress over the period of time, and the context or social context affect the meaning of concepts. Rodgers' evolutionary concept analysis believes that concepts should be continually modified so that their clearer meanings are revealed. The aim of this study was to reveal the concept of family-based care in chronic patients in ICU and to determine the characteristics, the implications and consequences of this.

Materials and Methods

The Rodgers' convergence process is a rotary and nonlinear method. In Rodgers' evolutionary method, data collection and analysis are in a structured, clear, flexible and inductive approach to the social and cultural context of various professions.[26]

The first step is to define the concept.[27] In this research, the concept of family-centered care in intensive care units was investigated. The second stage was the sampling of published studies that were analyzed and researched in the published literature on the concept of family-based care. Based on Rodgers' evolutionary approach, PubMed, ScienceDirect, google scholar, ProQuest, Medline, and a cumulative index of nursing and allied health literature (CINAHL) were selected.

In the initial search of family-oriented care terms, specialized care units and finally the combination of these two were used together. In this research, the criteria for entering the texts for incipient research and analysis of data were published in Persian and English on family care and special care between 1980 and 2016. To have a better vision, the concept of the original sources and existing books were also used. After the initial search, 68 articles were chosen based on the title or the abstract terms related to the concept.

Results

Each article was reviewed at least once. In the initial search, about 195 articles were examined. Then, according to the observance of entry and exit criteria, the number of articles was reduced to 94. Finally, 68 papers and two doctoral theses and a master's dissertation in the field of nursing and non-nursing were chosen. The main terms of the study, in the title or abstract, were selected based on full or in the abstract

form of the researcher. A comprehensive and complete concept of nursing books was used in the analysis process.

Therefore, the researcher with a frequent and accurate study of books and articles identified the codes related to the concept of family-centered care. Through reading the texts, information about the features, the fore and the consequences of the concept, the words of successor related to the concept were summarized and coded. In this study, the same items were identified and structured using rotary process and internal analysis. Then, they were identified in the main themes of the study.

The features of family-based care in ICU: Properties are the key and duplicate characteristics of concepts found in relevant texts or articles.[28] In the first stage of the analysis of the concept, the characteristics must be specified. By identifying the features, a more precise and realistic definition of the concept can be presented.[29] In the present study, the concept of family-based care in ICU was identified as a process-oriented concept with features of care management, education, and interaction.

Education: In all of the data, there was a relationship with the teaching of materials. The articles emphasized family education and care for the patient. Some recommended individual training and some group training. Training is for the proper care of the patient and the use of education to emphasize on education systems, teamwork, and family-patient interaction and family engagement to provide proper care for the patient.[28]

Caring education is the main focus of family-based care; thus, families who have not seen their care have become more likely to be hospitalized in their careers. Family-based care education has led to an increase in family health information. To enhance the level of knowledge, the training sessions have been used by group discussion and training manuals.[27]

The lack of training for nurses with special care about nursing the patient's family along with the responsibilities of nurses and the lack of nursing staff are among the reasons why nurses with special care should not allow the patient's family to have adequate access and participate in patient care. Clinical care for the patient's family has led to the participation of the patient's family in patient care.[28] For example, studies conducted by the Patient-Centered Family Care Institute showed that care education by the healthcare staff to the patient's family resulted in improvement of caring behaviors in the family of patients admitted in the special section. Also, the results of other studies indicated that education with family-centered care has a direct relationship.[29]

Interaction: Studies have shown that one side is family interaction, and family interaction with the health team is vital for family-based care.[25] Collaborative care planning is developed through the interaction of the client's family with the care team and the patient's family has active participation in the care program. The results of the studies showed that the interaction of the patient's family with the therapeutic team is necessary for assessing the needs of the patient.[27]

Also, other studies have shown that lack of psychological interaction in the education of care in the family of patients leads to family-based care failure.[26] Through interaction, the family can manage problems and can better take care of its own patient.[22]

In a study, Ramezani et al. concluded that the interaction between the family and the primary health care team is essential for the development of family involvement in patient care. As collaborative approaches have led to great effectiveness in the care of patients in intensive care units.[25]

Care management: Another aspect that is related to the concept of family-based care is

the control of care. In a study on family needs of patients admitted to the intensive care unit, it was stated that participation in control and care management is a two-way process, and participation in care depends on the control of the care by the family and care control. The relationship between the uses of these two concepts was somewhat ambiguous, and the concept of participation in care was more than the control of care.[27]

In a study called management and control, the results showed that the process of care management led to improvements in the health of patients.[24]

Care management: The concept of care management in ICU is so intrusive in our thinking, used in the design and delivery of health services.[24] Animal studies have emphasized on the application and effectiveness of the concept of care management.[28]

One of the main concerns in the field of care management is ethical observance and principles. Other concerns include lack of sufficient resources for the family of clients, initial readiness and care management skills, and the potential risks of caring for nurses and medicine by the family of patients.[27] One of the important tasks to reduce implementation problems is to establish standards for care management. For example, the family-based care community can be mentioned.[24] In these associations, the necessary education is given to the family of patients relating to decision-making, patient care behaviors, problem-solving, participation with a team for improving clinical outcomes, promotion of health status, quality of life, and, in general, any activity that helps prevent, treat and rehabilitation.[27] In addition, the concept of care management is closely related to the concept of family-based care. The economic and political factors affect the concept of care management.[21]

The concept of care management may have different meanings for different people at different times. In the care management program, the caregiver's family is involved in activities.[20]

Priorities of family care in the ICU: The second stage in the analysis of the concept of Rodgers' analysis is to identify the goals of the concept in question. There are events and occasions that occur before the family-centered care takes place.[22] Three types of advancements here include family-related advances (family efficacy, self-esteem), system-related (adequate resources, social factors, and cultural factors) and care providers (partnerships).

Efficiency in cognitive and social theories is highly utilized and the ability to perform a specific behavior is precise and through which the ability to perform care is predicted by the patient.[18] Effectiveness is the ability to do family work and is one of the important factors affecting family-based care. In a study conducted by the American Family-based Care Association, the results showed that family efficacy, anxiety, depression and self-confidence affect family-based care.[19] Therefore, the family of patients admitted to the ICU can be effective in improving their ability to function, well-being and the process of the disease by acquiring care skills.[16]

One of the important factors in family-centered care is in patients with special confidence. The results of the studies showed that families with high self-esteem and high self-care need less support in patient care, while families with low self-esteem and low self-efficacy have no role. Therefore, the healthcare team should spend a lot of time planning for training in these families.[15] Also, the results of another study showed that those with hemodialysis had less self-esteem. As a result, family-based care was weak due to hopelessness, depression and mental, psychological and physical problems.[12] Therefore, it is necessary for the family of patients to have more information about the state of illness and their care plans and to be

encouraged to take responsibility for the patient's health. The participation of the family of patients in the care programs, in addition to their greater cooperation with the health care team, changes their behavior in accordance with the health-care patterns and increases their self-esteem.

A systematic structure is essential for predicting social support, available resources and the impact of cultural factors on family-based care.[10] The results of the study showed that if the family of patients had sufficient social support and resources, they would have enough motivation to learn care for implementation of the therapeutic protocols and less likely to experience physical, mental and psychological problems. In addition, social support and sufficient resources have led to increased self-esteem in families.[12]

Individual and social support leads to increased family-centered care capabilities in the family of patients.[13] A study on social support in people with diabetes showed that one of the reasons for the neglect of family care was the lack of social support.[14] Cultural factors also play a role in family-based care. Therefore, in the health-care system, the culture of quality promotion and quality of care for patients in the special department should be defined as a goal and should be sought to achieve this goal.[15]

The involvement of caregivers with a family member plays an important role in the family-based care process in ICU. For example, in a study conducted by the Family-based Care Society, the results showed that if the patient's family and care providers are responsible for the treatment and family is supported by the healthcare team in the care of the patient, the family members will feel more competent and will be actively involved in the care of their patients.[16]

Henneman and Cardin study on the role of family in caring for chronic patients emphasizes the active participation of the patient's family, and it is based on the philosophy that if the family plays an active role in patient care, it has a higher quality of life.[17] Many adverse effects of the disease can be controlled by family-based care.[17] Also, participation and increasing the skill of family in patient care can change the behavior and improve the health of patients.[19]

Consequences of family-based care in ICU: The consequences are from the concept.[26] Consequences of the concept of family-centered care in this study was to reduce stress, increase the quality of life, change lifestyle, increase knowledge and increase family adaptation with patient status.[12] The outcomes of the studies showed that aftercare education in the family of patients in ICU improved the quality of life. The family learned and respected the patient's protection and prevention of the transmission of disease to others, they set their own plans for their patients, and given the status of their patients and their supportive institutions, and counseling centers supported them. The level of stress in the family of patients was reduced and they were busy with their daily activities.[11]

Other studies also showed that if families with many physical and psychological problems get supported by friends, teamwork and community, and attend care classes and receive a good education, the quality of their lives will increase significantly, as a result of their dependence on the health team.[9] For example, the results of studies have shown that if the family and care providers took on both the responsibility for treatment, the sense of competence increased due to participation in the care of the patient in the family, which led to an increase in the quality of life of the family and the recipient.[8]

Texture or background: In relation to the context, the results of the study showed that the concept of family-centered care was the central concept in the special care centers, although it was only used in the concept in

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emergency care providers or treatment centers (hospitals). During the past years, family-based care has been used repeatedly and the role, breadth and function of this concept have led to changes in the role and function of healthcare providers in the community. Family-based care involves physical, mental and psychological care in the acute phase of the disease by the family in health care centers. Several articles in the form of theoretical models, review, and meta-analysis and concept analysis have been discussed in the context of the concept of family-centered care. Several studies have shown that family-based healthcare programs can be enhanced through family planning programs in the family of patients, since family-based care delivery is more cost-effective and easier.

As stated in the previous article, various studies have been carried out on the family of patients in special sectors. Their results showed that the family care process in the patient's social context would lead to an increase in the quality of life of the family and patients.

Alternative words and related concepts: Alternative words and related concepts help to understand the differences, similarities, explanations of meanings, and the description of the concept and the term.[26] Alternative words and related concepts of family participation, family-focused care, family-oriented care, and family empowerment have been mentioned in the articles.[24] The term "family participation" has been used in more articles than "family-based care". However, the results of other studies showed that, in general, family-based care was used more than other terms.[15]

Discussion

Over the past few years, numerous factors such as time and context or background on family-centered care in ICU have been implicated in studies. Several studies have been conducted in specialized care units.[8] Generally speaking, problem-solving skills, goals and evaluation can determine the characteristics of the concept of family-centered care.[7] In relation to the concept of family-based care, researchers have a number of views. The differences in viewpoints are due to the performance, training, experience, role and scope of each discipline.

In the present study, the concept of family-based care in patients in ICU centers was identified as a process-oriented concept with care management features, care control, education and interaction. The results of this study showed that nursing articles have focused on family-centered education. Some recommended individual training and some group training. Patient care education is the main focus of care management and participation in care. When the family of patients is not trained care education, the patient is more likely to be admitted to the hospital. Also, literacy and health information lead to providing effective care of the patient,[5] in relation to the educational characteristic. The results of studies have shown that literacy, awareness and health information play key roles in care management and lead to increased family management capacity in specialized care units.[11]

Similarly, other studies have shown that in health education systems, education and health information are important and effective factors in the ability to manage care by the family. It has a great influence on the ability to perform in family-centered care.[12]

Educational strategies can be independent of age and socio-economic factors; therefore, each family at any socioeconomic level can obtain the necessary information in relation to health issues. However, published literature on nursing has influenced many factors, including social, cultural and contextual factors, on family education, assessment and evaluation.[16] In general, the results of other studies in the field of education are similar to our study.

Another feature of this study was interaction. The results of the study showed that interaction is the basis of family-based care and can be between the family and a nurse, patient and friends. The family interaction with the health team for the care of the patient is vital and important. Through the interaction of the patient's family with the care team, the needs of the patient are resolved and the family can take care of the patient more effectively. The results of the studies showed that nurses frequently interact with their families in order to solve the problems of clients.[14] Communication is important for family involvement in planning for a patient. Communication is essential, and planning and participation in care are difficult and even impossible without communication.[17]

Another feature that is related to the concept of family-based care is the ability to control family care. The results of this study showed that family-centered care and care controls are a two-way process and the experiences of life and cultural background of the patient's family. Controlling caring plays an essential role and this concept is a broad concept that takes into account the integrity of the individual.[18]

Care monitoring is used in nursing or non-nursing studies. The results of this study clearly demonstrated the application of care management with family-centered care.[19] In other studies, the results showed that the concept of family-centered care in nursing was more applicable to care management concept.[22] Other features of this study were care management. The results of this study showed that the concept in designing and providing health services, reduces patient care problems, decision-making, problem-solving, participation with the treatment team to improve clinical outcomes, improvement of health status, promotion of quality of life, and in general, every activity that contributes to prevention, treatment and rehabilitation.[23]

Conclusion

In this study, Rodgers' evolutionary concept analysis method was used to analyze the concept of family-based care using published texts in this field. The characteristics reflected from the concept of family-based care, education, interaction, and care management. The results of this study showed that the concept of family-centered care has evolved over the past years in chronic patients and patients admitted to special care units and nurses have been able to significantly improve their knowledge of family-centered care for patients. The syntax that nurses in the care groups have been significantly influenced by and managed to take responsibility for family-based care groups. As a result, this has led to an increase in the autonomy of the nursing profession and, ultimately, in strengthening nursing knowledge.

Conflict of Interests

Authors have no conflict of interests.

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Fever of unknown origin caused by child abuse; A case report

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Case Report

Abstract

BACKGROUND: Fever is the most common complaint in children. Some children frequently refer to treatment centers for long periods of continuous fever; and despite precise assessments, the cause of the fever is unknown. Since there is no evidence of relationship between fever of unknown origin (FUO) and child abuse, we report a case of fever of unknown origin case caused by child abuse.

CASE REPORT: An 8-year-old boy was referred to a pediatric ward of Mehr hospital in Malayer City, west of Hamadan Province, Iran, followed by a fever of unknown origin to assess the disease. The patient repeatedly had severe fever twice a month, since he was seven years old. He did not presented to hospital due to normalization for his family. He then returned to the hospital with repetition of fever and not responding to the medications used at home. After a few days of admission to the hospital and performing examinations and laboratory procedures and pictograph, there was no finding to determine the cause of the fever. However, in the interview, child's mother secretly expresses child abuse and her harassment with the concern and fear of the child's father.

CONCLUSION: Cultural beliefs and parental power are two phenomena that prevent the use of appropriate tools for understanding stresses and bitter experiences of childhood. For these reasons, history taking and physical examination by doctors and nurses in the hospital are limited only to the physical examinations. Therefore, there is a need for laws and strong supporters who can support doctors and nurses to report child abuse.

KEYWORDS: Fever, Pyrexia, Child, Child Abuse, Child Neglect

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Introduction

Fever is the most common complaint in children. A persistent fever is confusing and disturbing in the absence of a known source. It is stressful for child, parent, and health care providers.[1] There is no comprehensive definition of fever of unknown origin (FUO). Based on the clinical signs, fever of unknown origin refers to fever above 38.3 °C (101 °F) that occurs at least once a day and lasts for more than 8 days, and a reason cannot be determined for it after admission to hospital or outpatient screening. Various definitions have been presented in various studies for fever with unknown origin, but the duration of the fever is emphasized from five days to three weeks. The fever of unknown origin may have infectious or non-infectious causes.[2]

Many studies show that stresses and bitter experience of childhood can be the cause of many physical disorders, including fever of unknown origin or other physical illnesses.[3] Other studies show that stress-induced children are more likely to develop fever than other children. Mental events and chronic stress can cause fever, too.[4] Avicenna believes that a type of fever is a result of fear that sometimes occurs. A scared person is shocked, and fever takes place because of unexpected fear. In this type of fever, spirit flows inward,

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and suddenly occur. The pulse is swirling and the eyes also show fear.[5]

In differential diagnosis of fever in children, one of the things that are neglected is called child abuse. Many studies have documented the relationship between child abuse and its physical implications. Besides, the difference in the definition of child abuse in different cultures has caused some parents to neglect the importance of child abuse and its consequences.[6]

With a review of both domestic and foreign affairs, we found no article showing the association of child abuse and frequent fever. Considering the concern of health care providers and pediatricians about the delayed consequences of diagnosing childhood fever, and the fact that child abuse may create complicated conditions alone or in combination with other factors, we aimed to report a case of fever of unknown origin caused by child abuse.

Case Report

An 8-year-old boy was referred to the pediatric ward of Mehr Hospital in Malayer City, west of Hamadan Province, Iran, with his mother following a sever fever of 39.3 °C. It was found in evaluations that the patient repeatedly had a severe fever twice a month; they were not referred to the hospital due to normalization for his family, and they controlled fever with drugs that were at home. The child studied in the second year of the primary school. His state of intelligence was normal. He spoke calm and cumbersome. He had a good social relationship and spoke in Persian.

After being admitted in the hospital, chest X-rays and ultrasound studies and blood tests were conducted (Table 1). Urinalysis, urine culture, and stool exams were all normal and negative for any disease. There were no suspicious cases in either.

Then, the mother of the child spoke secretly and with fear about cases of child abuse by family's father. The mother of the child stated that the boy and his 1.5-year-old sister were the only children of the family with a modest middle-income. Children were continued to be physically punished by father from back of the waist, abdomen, and legs without any specific reason. As far as mentioned, even his 1.5-year-old sister and his mother were not being safe from these mayhems. The child himself stated that his father beat him with a pipe. According to the explanations, it was found that the rate of child harassment had increased in recent year which had a direct correlation with the child's fever, that was, fever repetitions continued with harassment.

Table 1. Hematology and biochemistry findings

Test	Result	Test	Result
White blood cell	8600.00	Fasting blood sugar (mg/dl)	78.00
Neutrophils (%)	80.00	Blood urea nitrogen (mg/dl)	12.90
Lymphocytes (%)	16.00	Creatinine (mg/dl)	0.53
Monocytes (%)	2.00	Calcium (mg/dl)	8.90
Band cell (%)	2.00	Sodium (meq/l)	132.00
Red blood cell ($\times 10^6$)	4.23	Potassium (meq/l)	3.86
Hemoglobin (g/dl)	12.20	ESR 1st hour (mm)	38.00
Hematocrit (%)	34.50		
MCH (pg/cell)	28.80		
MCV (fl)	81.60		
MCHC (g/dl)	35.40		
Platelets	172000.00		

MCH: Mean corpuscular hemoglobin; MCV: Mean corpuscular volume; MCHC: Mean corpuscular hemoglobin concentration; ESR: Erythrocyte sedimentation rate

Vulnerable mood and low self-esteem had brought down fear and anxiety in the child. The child did not have a quiet nocturnal sleep; he jumped with a shout through the horrible nightmares. In the studies, the mother described that because of father's aggressive behavior, she could not have any support for the child. The low cultural-social level of the family and the father's personality conflicts could be the causes of child abuse or family abuse. We found that this family lived in one of the villages in the city of Malayer, where the culture of violence was widespread in this village among its people. The mother said that when she wanted her husband to behave better and pay attention to the lives of the other families with their spouse and child, his husband stated that "they are not men who are fond of their family members".

Discussion

The results of the studies indicate that there is a relationship between fever and psychological problems. A psychogenic fever is a stress-related phenomenon.[7] Some patients experience high temperatures when exposed to emotional events. The mechanism of psychogenic fever is still not fully understood. Psychosis fever does not decrease with antipyretic drugs, but fever can be reduced with psychotropic drugs that are antianxiety and sedative, or through psychotherapy and solving patients' problems.[7]

Olivier suggests that fever can arise under the mechanisms other than infection, including central nervous system and parasympathetic disease.[8] Psychological fever is complex and occurs under psychological, physiological, or endocrinological mechanisms. Generally, the increase in body temperature due to psychological stresses is a universal phenomenon; but it needs to be taken into consideration because it depends on how it is measured. It is also suggested that we refer to fever in cases of inflammation and infections. So, it is better to use the word "psychogenic hyperthermia" in the cases of response to stress.[8]

Another important component of this patient is two phenomena of parental power and culture. Handwerker showed that the child's parents should have equal power.[9] Power inequalities lead to exploitative and compulsive behaviors. Women who lack power against their spouse will open the way to violence against their spouse and their children.[9]

Moylan states that 3.3 to 10 million children are exposed to domestic violence every year. It is expressed that annually 900,000 children are being abused by parents' abusive practices.[10] Some parents engage children in interactions and play with them, but some parents look at the issue from the power aspect and consider such behaviors meaningless. In fact, cultural differences continue in some parents' beliefs, even those born and raised in one culture, and passed on to subsequent generations with different norms,[10]

Of course, what kind of behavior do you consider to be child abuse? There are different definitions in different cultures. When there are differences in cultures, there are different rules about parental behaviors, but a universal law in all cultures states that abuse of children is prohibited, such as rough disciplinary behavior.[11] Therefore, in Iran, we need laws that protect doctors and nurses, who can easily report cases of child abuse, against the parents.

Conflict of Interests

Authors have no conflict of interests.

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