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Massage therapy for osteoarthritis of the knee: a randomized controlled trial. Arch Intern Med 2006; 166(22): 2533-8.

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4. World Health organization. *Strategic directions for strengthening nursing and midwifery services* [online]. Available from: URL:<http://www.npro.who.int/themes/focuses/theme3/focus2/nursingmidwifery.pdf>2002

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Evaluation of the effect of chain training methods on improvement of household awareness and attitude toward healthy nutrition

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Original Article

Abstract

BACKGROUND: Cardiovascular diseases (CVD) are one of the major causative factors of morbidity and mortality in the world which can be easily prevented through lifestyle changes. The aim of this study was to evaluate the effect of chain training methods on increasing household awareness on and attitude toward healthy nutrition in order to prevent CVD.

METHODS: This study was performed as a community trial. For the purpose of this study, 4 areas were selected and 4 educational methods were conducted in these areas. The participants were told to share their information with their neighbors and relatives in that area (chain training). Primary knowledge of the residents of these areas before and after the intervention were evaluated in a randomly selected sample (n = 400). Data were analyzed using independent t-test, chi-square, and Fisher's exact test.

RESULTS: Pre-intervention and post-intervention mean of knowledge were 16.42 ± 3.5 and 16.4 ± 3.6 , respectively (P = 0.025). Pre-intervention and post-intervention mean of knowledge did not differ in area 1, 2, and 4. A statistically significant increase in knowledge was only observed in area 3 (P < 0.001).

CONCLUSION: The use of chain training method by non-governmental organization (NGOs) may not be effective in increasing awareness on healthy lifestyle. Therefore, training through public classes and direct education by health personnel is recommended.

KEYWORDS: Training, Knowledge, Behavior, Nutrition

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Introduction

Cardiovascular diseases (CVD) are one of the major factors of illness and mortality in the world.^{1,2} The most important causative factors of CVD include unhealthy diet, physical inactivity, and tobacco consumption, which can be prevented through appropriate training.^{3,4} Recently, lifestyle changes have resulted in some nutritional risk factors in different communities such as Iran.⁵⁻⁸ Therefore, the general guideline of the American Heart Association has emphasized

the improvement of regional policies and community training in order to change their lifestyles as the main components of CVD prevention.^{9,10}

The different methods of health education include lectures, small group discussions, role playing, performing, film, direct observation, face-to-face training, procedures, and etcetera. One of these methods is chain training. In this method, a group are trained and they will transmit the educational materials to others¹¹. Today, some political issues and news spread over a population through this method. Now, the question is: "Can chain method be useful in health

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education?". Answering this question can be effective in teaching of health issues. Nevertheless, since there are not enough personnel, educating the society members by the health system is quite difficult. Evidently, this problem can be solved by society members' training others through chain education method.¹² The aim of this study was to investigate the effect of some training methods on knowledge promotion through chain education method.

Materials and Methods

The present study was performed as a community trial in the two cities of Sanandaj and Saqez, Kurdistan Province, Western Iran, in 2012 after being approved by the ethics committee of Kurdistan University of Medical Sciences.

In these two cities, four areas were non-

randomly selected based on the experts' opinions. The study was conducted in cooperation with four main non-governmental organizations (NGOs), which were experienced in health planning, and in four stages. First, for the uniformity of the education in all the intervention groups, the educational texts were prepared by nutrition experts of the health system in order to be used by the trainer. In the second stage, the primary knowledge status of the people before the intervention was evaluated in a 400-subject sample size randomly selected based on postal code from all areas. In the third stage, training and intervention programs were conducted by the selected NGOs which had previously participated in similar tasks based on the educational methods listed in table 1.

Table 1. List of intervention field in the study

City	The name of the area	Intervention methods	Teaching methods	Type of trainer	Participants in pre-/post-intervention
Sanandaj	Abbasabad	Providing 500 households with face-to-face training and educational CDs with an instruction card	Based on need assessment	Company working in educational and social interface	100-100
Sanandaj	Kanikozaleh	Training parents in schools (each individual only once)	Community-based education or local groups (CBO)	Social interface	100-100
Sanandaj	Farajah	Training through public classes and practical work in the review of food units consumed in the previous few days, measuring anthropometric indices, informing individuals about them, and practical training on cooking	Training in public classes and practical work	Health Personnel	50-50
Saghez	Shakarriz	Training of 323 households through public classes and private sessions, re-training by presenting weekly paper (24 cards per week), and practical nutrition education classes	Leitner method	Health interface	150-150

The participants were also told to share their information with their neighbors and relatives in that area (chain training). The standard questionnaire of the Heart Research Center of Esfahan¹³ was used in order to assess the level of knowledge. Then, post-intervention knowledge was evaluated in 400 participants selected randomly from these areas (participants in the pre-test were different from participants in the post-test in each areas).

The study data were entered into the SPSS statistical software (version 11.5, SPSS Inc., Chicago, IL, USA). Independent t-test was used to compare the level of awareness. Moreover, comparison of the qualitative variables between the two groups in every region was performed through chi-square and Fisher's exact tests. All P values below 0.05 were considered statistically significant.

Results

Among the study subjects, 13 (1.6%) were male and the rest were female. In addition, 706 (88.3%) were married and 292 (36.5%) were illiterate. According to table 2, mean scores of age, marriage status, and level of education did not differ between pre-intervention and post-intervention participants ($P > 0.05$). However, a difference was observed between the two groups in terms of gender ($P = 0.003$). Mean scores of knowledge in pre-intervention and post-intervention groups were 16.4 ± 3.5 and 16.4 ± 3.6 , respectively ($P = 0.025$). Mean scores of knowledge in pre-intervention and post-intervention groups did not differ between areas 1, 2, and 4. A statistically significant increase in knowledge was only observed in the area 3 group ($P < 0.001$) (Table 3).

Table 2. Demographic characteristics of participants

Variables		Pre-intervention (mean \pm SD)	Post-intervention (mean \pm SD)	P
Age		39.1 \pm 14.1	38.2 \pm 13.8	0.388
Gender	Male	12.0 \pm 3.0	1.0 \pm 0.2	0.003
	Female	388.0 \pm 97.0	399.0 \pm 99.8	
Marital status	Single	46.0 \pm 11.5	48.0 \pm 12.0	0.826
	Married	354.0 \pm 88.5	352.0 \pm 88.0	
	Illiterate	148.0 \pm 37.0	144.0 \pm 36.0	
Level of education	Primary school	110.0 \pm 27.5	112.0 \pm 28.0	0.741
	Middle school	53.0 \pm 13.2	64.0 \pm 16.0	
	Diploma	64.0 \pm 16.0	54.0 \pm 13.5	
	Academic	25.0 \pm 6.2	26.0 \pm 6.5	

SD: Standard deviation

Table 3. Comparison of the mean score of knowledge between the control and interview groups

Type area	Educational Method	Pre-intervention (mean \pm SD)	Post-intervention (mean \pm SD)	P
Area 1	Based on need assessment	15.3 \pm 2.8	14.9 \pm 2.8	0.269
Area 2	Community-based education or local groups (CBO)	17.8 \pm 3.2	16.7 \pm 3.4	0.056
Area 3	Training through public classes and practical work	16.7 \pm 3.2	18.4 \pm 2.9	< 0.001
Area 4	Leitner method	16.2 \pm 3.9	16.0 \pm 3.8	0.701
Total	-	16.4 \pm 3.5	16.4 \pm 3.6	0.025

SD: Standard deviation

Discussion

In the present study, training through public classes and practical work in the review of food units consumed in the previous few days, measuring anthropometric indices, informing individuals about them, and practical training on cooking was effective in increasing nutrition awareness. This study shows that chain education may not be effective. The significant difference between the two groups' mean scores of knowledge after the education by the health workers shows that the implementation of this method in the trained groups has been quite effective. The initial training was performed through various methods and the participants were asked to share the content they learned with others. However, the results showed that the chain training method is effective and encourages individuals to educate others and share their information with others. Kafeshani *et al.* investigated the mothers' knowledge status in the marginalized households of Isfahan, Iran, and showed that 20.6% of the mothers had desirable knowledge, while 79.4% had moderate and poor knowledge.¹³ Researchers, in another study, mentioned literacy level as one of the factors effective on the level of knowledge before and after the training¹⁴. Having more knowledge can improve health-related behaviors.¹⁵ Education is the foundation of all learning.¹⁶ In this study, various methods were used in the training programs. Although the headlines of educational materials and intervention during the period were similar in all groups and only the training methods were different, other groups had no effects on the creation of the educational chain. Some other studies which have addressed the efficacy of various educational methods have also reported differences in the effectiveness of various methods in improving the level of knowledge.¹⁷ Nevertheless, in order to design health education interventions in this province and probably all through the country, NGOs alone do not have the ability to train and health workers should be used as instructors.^{18,19} In an

ideal condition, nutritional counseling and education should be designed based on the education level of the individual.²⁰ In addition to differences in length and method of providing the training, in many studies, educational researches are designed according to specific individuals,^{21,22} training and consultation take place from person to person,^{19,23} or a combination of nutritional education and behavioral counseling is presented.²² Kim *et al.* demonstrated that the village health worker training program is effective in building health promotion capacity of community leaders and can be a main method for helping lower developed countries with further development²⁴. On the other hand, educating individuals and raising their level of knowledge has been shown to be highly effective in improving their nutritional status.^{25,26} Evidently, an individual's nutritional behavior is not only affected by his/her nutritional knowledge and can be influenced by numerous factors.^{27,20} The present study had one limitation, i.e. the members of the second sample were not asked whether someone had transferred the trainings to them or not because the goal of the study was creating the educational chain.

Conclusion

According to the results of this study, using health personnel with sufficient education experience is very important in NGO educational programs because they have the required level of knowledge and communication ability, and the trainees will probably trust them more.

Conflict of Interests

Authors have no conflict of interests.

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Snoring and Attention deficit hyperactivity disorder in Children in Qom, Iran

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Original Article

Abstract

BACKGROUND: Attention deficit hyperactivity disorder (ADHD) is an important and common problem in children (4-12%) which affects their daily activities and quality of life. About 1-2% of children suffer from sleep apnea with a common symptom of snoring which might cause behavioral disorders due to the lower quality of sleep. In the present study, we aim to determine the association between snoring and ADHD.

METHODS: In this case control study, we enrolled 100 children of 2-12 years who snored as the case group and 100 healthy peers as the control group. Snoring and behavioral problems were assessed by the standard questionnaires of the Berlin Questionnaire and Behavioral Disorder Questionnaire [DSM-IV], respectively.

RESULTS: The mean age, height, and weight of children were 6.81 years, 116.11 cm, and 25.39 Kg, respectively. In addition, 53.5% of participants of both groups were boys. A significant relationship was found between snoring and ADHD and its subtypes ($P < 0.001$).

CONCLUSION: Increasing the information of parents and colleagues on the association of snoring with behavioral disorders might assist in early diagnosis and treatment.

KEYWORDS: Snoring, Attention deficit hyperactivity disorder (ADHD), Behavioral Disorders, Children, Sleep Apnea

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Introduction

Snoring is a coarse and loud sound caused by the obstruction of air passage which prevents the movement of air during breathing while sleeping. Snoring occurs in the throat after relaxation of the muscles in respiratory structures due to the vibration of soft tissues while breathing.¹ Snoring is a common sign presenting in 10-12% of children less than 7 years of age.²⁻⁵ The incidence decreases gradually by increasing of the age after 9 years of age. Resistance at upper airway passage is the main reason of snoring, which can cause obstructive sleep apnea (OSA). Snoring is the most common symptom of OSA. Its other

symptoms are difficulty in breathing and asphyxia.⁶ Airway obstruction causes the child to wake up frequently.

The incidence of OSA is 1-2% among children of 2-8 years of age.^{1,2} Snoring without apnea and hypopnea during sleep is termed primary snoring.⁷ The most important cause of snoring in children is adenotonsillar hypertrophy which usually requires medical or surgical intervention. However, according to recent studies, primary snoring will improve gradually by age and does not need any treatment.^{8,9}

Attention deficit hyperactivity disorder (ADHD) is one of the most common disorders among school-aged children with an incidence rate of 4-12%.¹⁰ The prevalence of ADHD in American studies has been reported to be in the range of 2% to 26% depending on the definition

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used.¹¹ Based on criteria of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV), 8.7% of children of 8 to 15 years of age in the USA are affected.¹¹ In Iran, ADHD has been estimated to affect 15.2% of elementary schoolboys.¹² Others have reported a prevalence of 10.1% in Shiraz, a major Iranian city.¹³ In two studies performed in the Northeast of Tehran, the incidence was reported to be 12.3% and 11% of preschool children.^{14,15} In a meta-analysis of an epidemiologic study which included 24 studies on parents and 10 studies on teachers using a questionnaire, the incidence of ADHD was 5.3 and 10.3%, respectively.¹⁶ The main symptoms of this disease are inattentiveness, hyperactivity, and impulsivity. The pathophysiology of ADHD is unclear, but there are a number of theories such as involvement of dopamine, glutamatergic, or other neurotransmitter systems in the prefrontal cortex.^{17,18}

The DSM-IV divided ADHD into 3 subtypes: predominantly inattentive (ADHD-I), predominantly hyperactive and impulsive (ADHD-HI), or combined form (ADHD-C).¹⁹ Children who snore may suffer from daytime sleepiness, hyperactivity, learning disorder, restless sleep, and movement, and behavioral disorder while sleeping.²⁰⁻²⁴ In many of these children, it is difficult to differentiate between primary snoring and OSA.²⁵⁻²⁷ A recent study performed by the American Academy of Children demonstrated that the rate of daytime behavioral and cognitive disorders observed in children with OSA was higher than three times that in children without apnea.²⁸ In another comparative study on the effect of snoring in presenting with hyperactivity, it was demonstrated that 22% of patients with habitual snoring were hyperactive compared to only 12% of hyperactive children without snoring.²⁹ In spite of the increasing obesity and inactive lifestyle, and consequently, high prevalence of snoring among children in Iran, this research was performed with the aim of finding the association of snoring with ADHD.

Materials and Methods

This case control study was performed in winter 2011 in Qom, Central Iran. The study subject consisted of children of 2-12 years of age referring to the Baharan Private Clinic and Beheshti Hospital in Qom. The inclusion criteria comprised of children of 2-12 years without chromosomal and brain abnormalities such as Down syndrome and cerebral palsy. Participants with snoring were established as case group, and those without snoring as control group. According to the inclusion and exclusion criteria and considering previous studies, 200 individuals (100 patients in each group) were selected using simple random sampling method.^{30,31}

Data gathering tools consisted of 3 questionnaires; a demographic questionnaire, the Berlin Questionnaire, and the DSM-IV. The Berlin Questionnaire is a validated questionnaire developed in 1996, and its validity and accuracy in primary care settings has been approved.³² It explores known symptoms and features of OSA. The details of the questionnaire have been published previously.³³ The questionnaire is divided into 3 sections. Section 1 addresses snoring and witnessed apnea. Respondents, who snore, are asked to rate their snoring with regard to loudness, frequency, and whether their snoring bothers other people. Section 2 addresses daytime fatigue and sleepiness. Section 3 addresses personal history of hypertension, as well as, height, weight, and gender. Then, the body mass index (BMI) is calculated. In this study we only used section 1 of the questionnaire. The validity and reliability of the questionnaire have been investigated and approved in different studies and several languages, including Persian.^{34,35}

To assess inattentiveness, impulsivity, and hyperactivity in patients with ADHD, the DSM-IV was applied. This standard questionnaire consists of 18 questions; 9 questions assess inattentiveness, and the other 9 questions assess hyperactivity and impulsivity. The cut-off score for evaluating inattentiveness in this questionnaire was at least 6 and for hyperactivity

and impulsiveness (both together) at least 6. The subtypes of this disorder were also identified according to this questionnaire. Therefore, the children were categorized as ADHD-I subtype, ADHD-C subtype, or ADHD-HI subtype. The validity and reliability of this questionnaire has been approved.^{19,36,37} In this study, children's parents were selected and invited for an interview by the research team. In addition, to increase the accuracy of the test, the questionnaire was completed during a programmed interview by trained interviewers. ADHD diagnosis was provided by a physician. Considering ethical issues and confidentiality (personal identification was not recorded), and after explaining the goal of the study to the children and their parents, the questionnaires were completed with their consent. The data were analyzed using SPSS statistical software (version 18, SPSS Inc., Chicago, IL, USA). Chi-square test or Fisher's exact test were used for data analysis of qualitative variables. For adjustment of age and weight, multiple logistic regression models with backward method were performed. Differences

were considered significant at P-values of less than 0.05.

Results

In this study, the mean \pm SD age, weight, and height of participants were 6.68 ± 3.01 years, 26.66 ± 17.02 kg, 115.81 ± 21.91 cm, respectively. Moreover, 53.5% of precipitants were male. Details of demographic parameters in each group are illustrated in table 1.

Among the case group, 27% snored which bothered others, 35% snored slightly louder than breathing, and 12% snored very loudly and could be heard in adjacent rooms. In the case group, the snoring experience intervals were as follows: 31% snored every night, 21% snored 3-4 times a week, 21% snored 1-2 times a week, and 27% snored 1-2 times a month.

In the present study, 72% of children in the case group had ADHD, and 49.9% of boys and 38.3% of girls below 7 years had ADHD which all showed significant relationship among ADHD and snoring ($P < 0.001$, $P < 0.001$, and $P = 0.048$, respectively). Details of other results have been given in table 2.

Table 1. Average and standard deviation of age, weight, and height in both groups

Variable	Group	Mean \pm SD	Minimum	Maximum
Age	Case	7.51 \pm 2.81	2	12
	Control	5.85 \pm 3.00	2	12
Weight	Case	28.82 \pm 12.12	12	65
	Control	24.50 \pm 20.64	9	66
Height	Case	119.59 \pm 22.54	65	161
	Control	112.10 \pm 20.73	75	164

SD: Standard deviation

Table 2. Frequency distribution of attention deficit hyperactivity disorder combined (ADHD-C) generally and according to sex and age in case and control groups

Variables		ADHD-C		B	SE	P	Adjusted OR	95% CI for OR	
		Yes n (%)	No n (%)					Lower	Upper
Group	Case	52 (72.2)	48 (37.5)	1.36	0.34	< 0.001	3.91	1.99	7.66
	Control	20 (27.8)	80 (62.5)						
Gender	Boy	53 (49.5)	54 (50.5)	1.14	0.342	< 0.001	3.14	1.60	6.14
	Girl	19 (20.4)	74 (79.6)						
Age (year)	< 7	44 (38.3)	71 (61.7)	0.63	0.339	0.048	1.89	0.97	3.67
	> 7	28 (32.9)	57 (67.1)						

ADHD-C: Attention deficit hyperactivity disorder combined; SE: Standard Error; CI: Confidence interval; OR: Odds ratio

Table 3. Frequency distribution of attention deficit hyperactivity disorder inattentive (ADHD-I) in general and considering gender and age in case and control groups

Variables		ADHD-I		B	SE	P	Adjusted OR	95% CI for OR	
		Yes n (%)	No n (%)					Lower	Upper
Group	Case	40 (95.2)	60 (38.0)	3.48	0.74	< 0.001	18.60	5.48	63.68
	Control	2 (4.8)	95 (62.0)						
Gender	Boy	31 (29.0)	76 (71.0)	0.48	0.43	0.106	1.98	0.86	4.55
	Girl	11 (11.8)	82 (88.2)						
Age (year)	< 7	18 (15.7)	97 (84.3)	0.62	0.40	0.290	0.66	0.30	1.43
	> 7	24 (28.2)	61 (71.8)						

ADHD-I: Attention deficit hyperactivity disorder inattentive; CI: Confidence interval; OR: Odds ratio

Table 4. Frequency distribution of attention deficit hyperactivity disorder hyperactive and impulsive (ADHD-HI) in general and according to gender and age in case and control groups

Variables		ADHD-HI		B	SE	P	Adjusted OR	95% CI for OR	
		Yes n (%)	No n (%)					Lower	Upper
Group	Case	45 (69.2)	55 (40.7)	1.06	0.341	0.002	2.90	1.48	5.70
	Control	20 (30.8)	80 (59.3)						
Gender	Boy	48 (44.9)	59 (55.1)	1.14	0.344	< 0.001	3.12	1.57	6.19
	Girl	17 (18.3)	76 (81.7)						
Age (year)	< 7	41 (35.7)	74 (64.3)	0.68	0.349	0.043	1.99	1.02	3.88
	> 7	24 (28.2)	61 (71.8)						

ADHD-HI: Attention deficit hyperactivity disorder hyperactive and impulsive; CI: confidence interval; OR: Odds ratio

This study showed that there is a significant relationship between snoring and ADHD-I ($P < 0.001$). However, according to gender and age, there were no prominent relationships among ADHD-I and snoring ($P = 0.106$ and $P = 0.290$, respectively). Table 3 shows other results of this study.

Furthermore, as can be inferred from the table 4, there are significant relationships among snoring and ADHD-HI generally ($P = 0.002$) and according to age below and over 7 years ($P = 0.043$, CI: 1.02-3.88). Moreover, there was a significant relationship between snoring and ADHD-HI according to gender ($P < 0.001$, CI: 1.57-6.19).

Discussion

Few studies have been performed on daytime behavioral disorders related to snoring in Iran. This study was performed using the Berlin Questionnaire and DSM-IV. In this study, a significant number of participants with snoring had ADHD-I and ADHD-HI. Chervin et al.

conducted a study to examine the relationship between behavioral disorders and snoring in 220 children between 2-12 years.³⁸ Based on their results, the prevalence of hyperactivity was 13%. Children with habitual snoring are 4.4 times more at risk, those with loud snoring 4.5 times, and those with apnea 4 times more at risk of hyperactivity than others.³⁸

Other studies showed a strong relationship between snoring and daytime behavioral disorder.^{5,29,39} Animal models have been used to uncover the biological mechanism, which found hypoxia, multiple awakening during the night, or both as responsible factors.⁴⁰ In the study conducted by LeBourgeois et al., a significant relationship was observed between chronic snoring in children and ADHD-HI.⁴¹ Sleepiness in hyperactive children can be attributed to the low quality of sleep.⁴² In our study, based on the percentage rates and OR, correlation among boys and children over 7 years of age were more significant. However, some researches, like a

study on 113 children by Kaemingk et al., found no significant relationship between snoring and OSA, and hyperactivity.⁴³

In another study in which 69 children had OSA and 70 children did not have this problem, no differences were reported between the two groups regarding hyperactivity, inattentiveness, and the symptoms of ADHD.⁴⁴ Another study was performed on 205 children by Gottlieb et al.⁴⁵ Although this research showed a significant relationship between snoring and OSA, and behavior disorders based on history and cognitive tests of children's attention using polysomnography, these findings were not significant.⁴⁵

In a previous study, the majority of patients with sleep apnea suffered from snoring, which shows that snoring is an important risk factor for OSA.⁴⁶ Apnea can cause brain hypoxia which is very dangerous in children and might leave permanent damage. For this reason apnea in children can be interpreted differently than in adults. Contrary to adults, even 1 apnea per hour in children should be considered important. Furthermore, snoring and apnea causes frequent waking up during sleep time, and consequently, decreases the quality of sleep due to shortening of rapid eye movement (REM), and non-REM sleeps at steps 3 and 4. This problem can be the cause of behavioral and movement disorders during night time and cause inattentiveness, sleepiness, depression and anxiety, learning disorder, and impulsivity during day.^{47,48}

There were some limitations in this study such as unwillingness of some parents to cooperate in completing the questionnaires, and lack of knowledge about signs and symptoms of sleep disorders and snoring and scientific resources and researches among children in this regard.

Conclusion

In summary, considering the prevalence of snoring among children, its relation with behavioral disorders, and the effects of sleep disorders on children's growth, education, and

quality of life, it is fundamental to identify the causes of snoring and escalation of factors, and find solutions to improve their life.

Conflict of Interests

Authors have no conflict of interests.

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The relationship between air pollution exposure and chronic obstructive pulmonary disease in Ahvaz, Iran

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Original Article

Abstract

BACKGROUND: Air pollutants can have harmful effects on human health. Chronic obstructive pulmonary disease (COPD) is represented by a spectrum of obstructive airway diseases. The aim of this study was to evaluate the relationship between air pollution exposure and COPD in Ahvaz, Iran.

METHODS: The present epidemiological study was performed in Ahvaz city. Data were obtained from the Ahvaz Department of Environment (ADoE). Sampling was performed for 24 hours in 4 stations. Raw data processing was performed using Microsoft Excel software, and after the impact of meteorological parameters, data were converted as input file into the model. Data analysis was performed using SPSS for Windows.

RESULTS: The results of this study showed that the annual average PM₁₀ concentration during 2012 was 727 µg/m³. According to the research findings, the two stations of Bureau of Meteorology and the city center had the highest and the lowest PM₁₀ concentrations during 2012, respectively. The results showed a strong correlation between visits to a hospital due to COPD and PM₁₀ emission in Ahvaz city. Approximately, 6.2% of hospital admissions for COPD occurred when the PM₁₀ concentration was higher than 30 µg/m³.

CONCLUSION: The findings of the present study showed that the total mean of particle matter was higher than the standard concentration. The higher percentage of hospital admission could be the result of the dust storm, higher average PM₁₀, and sustained high concentration days in Ahvaz.

KEYWORDS: Chronic Obstructive Pulmonary Disease (COPD), Air Pollution, Ahvaz

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Introduction

Air pollutants can have harmful effects on the human health. The significance of this issue lies in the damaging impacts of high, potentially

harmful pollutant levels produced in the environment on human health.¹⁻³ The main sources of PM₁₀ are transportation, urbanization, industries, economic development, domestic fuel burning, and vehicles in megacities.⁴ The adverse health effects of air pollution may be classified into 2 classes; short-term and long-term effects.⁵

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In recent years, several hundred epidemiological studies have shown a relationship between air pollution, typically particle matter in the air of urban areas, and diseases, pulmonary damage, and mortality among the population.⁶⁻¹¹ Particulates are the deadliest form of air pollution due to their ability to penetrate deep into the lungs, and can have health effects on humans.¹²⁻¹³ The World Health Organization (WHO) reported that a 10 micrograms increase of aerosols increases the mortality rate by 1 to 3%.⁸ The main symptoms of chronic obstructive pulmonary disease (COPD) include shortness of breath, cough, and sputum production.¹⁴⁻¹⁶ Long-term exposure to sources of air pollution causes an inflammatory response in the lungs resulting in the narrowing of the small airways and breakdown of lung tissue known as emphysema.^{14,17} The results of previous studies show that COPD affects 329 million people or nearly 5% of the population worldwide. In 2011, it ranked as the fourth leading cause of death, killing over 3 million people.¹⁸ Hospital admissions have been recognized as a sensitive marker for assessment of air pollution effects on human health.¹⁹⁻²⁰ In another study conducted in Taiwan, an association was found between air pollutant levels and hospital admission in patients suffering from ischemic stroke, chronic obstructive pulmonary disease, and asthma exacerbation.²¹ Dockery et al., in a cohort study, have shown the adverse health impact of long-term air pollution exposure in 6 US cities.²² This study demonstrated that chronic exposure to air pollutants is independently related to cardiovascular mortality.²² Isabelle performed health impact assessment of air pollution in México.²³ Based on the results of this study, with an increase of 20 $\mu\text{g}/\text{m}^3$ in pollution, the risk of death increased by 82%.²³ In Another study, an estimated 413 hospital admissions were attributed to PM₁₀ in the 8 major Italian cities, in 1998.²⁴ In similar study, Mohammadi studied the association between COPD and PM₁₀ levels in Ahvaz, Iran, in 2009.²⁵ Moreover, Goudarzi

studied the association between COPD and PM₁₀ levels in Tehran, Iran, in 2009.²⁶ Zalaghi studied the association between COPD and PM₁₀ levels in Ahvaz, Bushehr and Kermanshah, Iran, in 2010.²⁷

From the past to present, Ahvaz has been well known for its industries as well as its environmental pollution. In the last decade, an anthropogenic source of air pollution (dust storm) has been added to its other environmental problems.²⁸ The physical, chemical, and biological characteristics of dust storm have been well documented.^{28,29} The aim of this study was to assess the potential relationship between COPD and PM₁₀ exposure in Ahvaz city (located in South-Western Iran) during the year 2012.

Materials and Methods

This was an epidemiological study. PM₁₀ data was analyzed using Microsoft Excel (Microsoft Corporation, Redmond, WA, USA) and AirQ model. The present study assessed the potential effects of PM₁₀ exposure on human health. The rate of COPD attributed to PM₁₀ exposure in Ahvaz in 2012 was calculated based on relative risk (RR) and attributable proportion.

Ahvaz, with a population of approximately 1 million residents and an area of 8152 km², is the capital of Khuzestan Province. It is located between 48 degree to 49°29' east of Greenwich meridian and between 31° and 45' min to the north of the equator.¹ The location of the study area and sampling station are displayed in figure 1. Sampling was performed for 24 hours in 4 stations. The sampling stations were in downtown "Naderi", the Old School of Public Health "Behdasht Ghadim", Bureau of Meteorology "Havashenasi", and the Head office of Ahvaz Department of Environment (ADoE) "Mohitzist". In this study, 4 × 365 samples of Ahvaz's air were collected. Raw data processing using Excel software includes coding, averaging, and filtering. After the impact of meteorological parameters, data was converted into an input file for the AirQ model. The extent of the health effect attributed to PM₁₀ was determined based on the

RR and attributable proportion. The attributable proportion is multiplied at baseline incidence and divided by 10^5 . Attributable proportion is defined as the fraction of the health outcome attributable to exposure to a given atmospheric pollutant in a certain population. Obtained value should be multiplied by the population (10^6). Attributable proportion is proven causative correlation between health consequences and air pollutant exposure. Attributable proportion was calculated using the following formula:

$$AP = \frac{\text{SUM} \{(\text{RR}(c)-1) \times p(c)\}}{\text{SUM} (\text{RR}(c) \times p(c))}$$

where AP is the attributable proportion, $p(c)$ is the population of the city, and RR is relative risk.

In the present study, the default model that attributes cases of COPD to PM_{10} exposure was used. In addition to total attributable cases, we could estimate the distribution of attributable cases in terms of concentration intervals of the pollutant.³⁰

The RR is a ratio of the probability of the event occurring in the exposed group versus a nonexposed group. The RR is a measure of association between a disease or condition and a factor under study. It is calculated by dividing the incidence rate among those exposed to the factor by the incidence rate among those not exposed to the factor. The population prevented fraction refers to situations where exposure to a factor is protective.³¹

$$\text{RR} = \frac{\text{Incidence in the exposed}}{\text{Incidence in the nonexposed}}$$

Indeed, uncertainty of the effect (and the range of estimated effects) is larger due to exposure assessment errors and non-statistical uncertainties of the concentration-response function. Thus, there may be an increase in death toll due to increase in the concentration of pollutants. The primary and secondary standard of particulate matter according to the National Ambient Air Quality Standard (NAAQS) for 24 hours is $150 \mu\text{g}/\text{m}^3$.³² The standard of particulate matter

according to the European Air Quality Standards (EU AQS) for 24 hours is $50 \mu\text{g}/\text{m}^3$ and 1 year is $40 \mu\text{g}/\text{m}^3$.³³

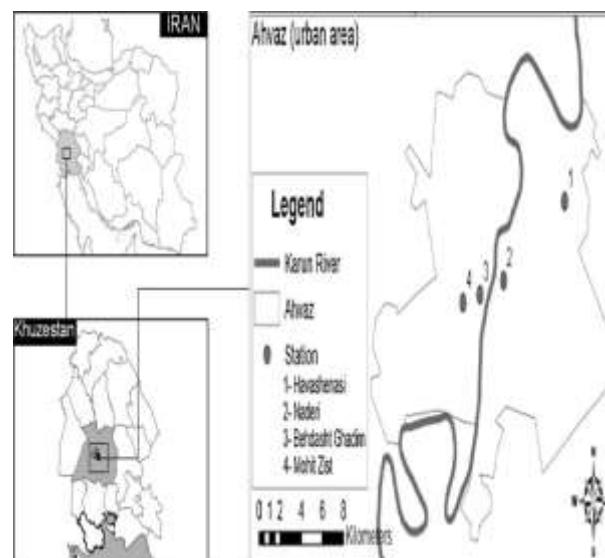


Figure 1. Location of the study area and sampling stations in Khuzestan Province (Ahvaz city), in the South West of Iran.³⁴

Results

According to the research findings, the yearly average PM_{10} concentrations during 2012 were $727 \mu\text{g}/\text{m}^3$. Table 1 shows that the annual average of PM_{10} concentration in Ahvaz is higher than the EU AQS ($50 \mu\text{g}/\text{m}^3$) standard and also much higher than the NAAQS standard ($150 \mu\text{g}/\text{m}^3$). The annual mean, spring mean, summer mean, winter mean, autumn mean, and the 98 percentile of PM_{10} concentration in these stations have been presented in table 1.

In terms of morbidity, hospital admission for COPD based on PM_{10} concentration is shown in table 2. Estimated number of excess cases for of hospital admission due to COPD attributed to PM_{10} exposure at lower, average, and higher confidence interval of RR was 993, 1602, and 2143, respectively. Average RR is corresponded to 1602 as predicted number of excess cases and it can be a good representative of the real situation in standpoint of the health effects of PM_{10} .

Table 1. Highest and lowest concentrations of PM₁₀ (µg/m³) corresponding to stations in Ahvaz during 2012

Parameter	Stations Ahvaz (mean ± SD)	Lowest station (Downtown) (mean ± SD)	Highest station (Bureau of Meteorology) (mean ± SD)
Annual	727.65 ± 47.30	624.32 ± 38.3	821.6 ± 48.90
Spring	985.04 ± 38.43	763.50 ± 50.1	1364.7 ± 60.40
Summer	646.61 ± 46.38	521.63 ± 39.5	810.0 ± 38.97
Autumn	348.00 ± 28.30	287.36 ± 16.8	425.2 ± 32.30
Winter	922.42 ± 58.63	810.36 ± 54.3	1234.8 ± 66.89
Annual 98 percentile	2663.53 ± 86.50	2244.62 ± 76.9	3412.6 ± 104.30

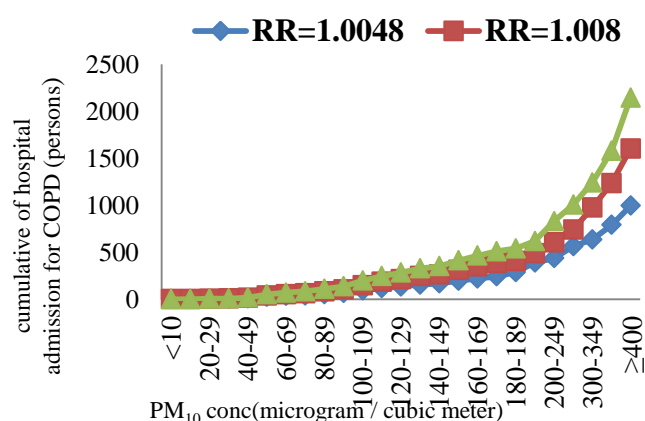
SD: Standard deviation

Table 2. Relative risks, attributable proportions and number of people suffering from chronic obstructive pulmonary disease (COPD) due to PM₁₀ exposure

Estimate	Indicator	RR (Medium)	AP (%)	Attributable excess cases (persons)
Low		1.0048	15.2453	993.40
Average		1.0080	22.7156	1602.41
High		1.0112	19.8952	2143.50

RR: relative risks; AP: Attributable proportions

As figure 2 indicates, despite the RR of the health effects of exposure to PM₁₀ concentrations below 20 µg/m³, due to lack of contact with the population, the concentration is 0. In other words, PM₁₀ concentration has not been below 20 µg/m³ on any day in 2012. The rising trend of hospital admission cases due to COPD with increasing concentrations of PM₁₀ between 60 to 180 µg/m³ has a uniform trend.

**Figure 2. Relationship between cumulative numbers of hospital admission due to COPD based on PM₁₀ concentration**

Discussion

In recent decades, air pollution is considered to

be a serious threat to the environment, and quality of life and health of people. In this study, we estimated the effects of exposure to PM₁₀ air pollution, such as COPD, using the AirQ model in Ahvaz. Figure 2 illustrates PM₁₀ concentrations based on related health endpoint and average concentrations during different seasons. These cases can be the result of produced dust storm, transportation, and industrial processes. The major sources of PM₁₀ that can increase COPD are the result of dust storms, and human interventions particularly road traffic, stationary combustion, and industrial processes. Ahvaz has been well known for its industries such as petroleum steel and power stations. In the last decade, an anthropogenic source of air pollution has been added to other environmental problems. Based on the results, the number of excess cases of hospital admission for COPD attributed to PM₁₀ at average RR was 1602 persons. The lower level of RR may be an indication of the improvement of urban air quality by the implementation of emission control strategies. Therefore, higher RR can signify mismanagement in urban air quality.

The increase in the developing world between 1970 and 2000 is believed to be related to increasing rates of smoking in this region, an

increasing population, and an aging population due to fewer deaths from other causes such as infectious diseases.³⁵ In some countries, the rate of mortality has decreased in men, but increased in women.³⁶ This is most likely due to the similar rates of smoking in women and men. Moreover, COPD is more common in older people.^{14,37} In the United States, approximately 6.3% of the adult population, totaling approximately 15 million people, has been diagnosed with COPD.³⁸

As the results showed, 3 ranges of RR based on the model's default were considered for assessing the health effects of PM₁₀. Furthermore, BI values were obtained from the model's default. In addition, spring and autumn had the highest and the lowest PM₁₀ concentrations during 2012, respectively. The study was performed on the 1 million residents of Ahvaz and based on BI of 1260 per 100,000 people in 2012. Furthermore, 63% of COPD cases occurred on days with pollutant level not exceeding 60 µg/m³. Based on the results of this study, 6.2% of all cases of hospital admission for COPD was attributed to respiratory PM₁₀. In a similar study by Goudarzi et al, the AirQ model was used to estimate the health effects of PM₁₀ on potential COPD in Tehran (capital of Iran).³⁴ Based on their results, almost 3.6% of all cases of COPD are attributed to PM₁₀ concentrations greater than 30 µg/m³.³⁴ In 2011, there were approximately 730,000 hospitalizations in the United States due to COPD.³⁹ The results of this study showed that very high concentration of PM₁₀ in Ahvaz can result in high rates of hospitalizations. Furthermore, Mohammadi found that approximately 4.1% of hospital admissions due to COPD occurred when the PM₁₀ concentration was higher than 20 µg/m³.²⁵ High percentages of the observed health endpoints in this study were associated with high concentrations of measured PM₁₀ in Ahvaz. The WHO has emphasized the effects of air pollutant concentrations on COPD.⁴⁰ In addition, the results of this study demonstrates the impact of air pollution on an increased incidence of COPD. Zalaghi performed a survey

on the health effects of air pollution in Ahvaz, Bushehr, and Kermanshah in 2010.²⁷ Based on the results, approximately 4.8, 2.4, and 1.7% of COPD cases in Ahvaz, Kermanshah, Bushehr, respectively, were attributed to PM₁₀.²⁷ Based on the results of the present study, the number of cases of hospitalization was relatively higher because of the higher concentration air pollution in Ahvaz city.

The major limitations of this study were the lack of databases and indicators, which forced us to use the figures provided by the WHO (Middle East region) for calculated health effects attributed to PM₁₀. Therefore, to estimate the health effects of air pollutants, epidemiologic studies are required for accurate calculation of RRs and BIs. Accordingly, cost-effective measures and management schemes should be considered to abate air pollution concentrations and/or reduce exposure of the general population to air pollutants. Finally, the survey results show that implementation of basic actions to the control PM₁₀ entering into the stratosphere by decreasing of emission particle matter and development of green space is essential.

Conclusion

According to the present research findings, 6.2% of hospital admissions for COPD were attributed to respiratory PM₁₀. High percentages of observed health endpoints were associated with high concentrations of PM₁₀. Thus the use of methods to decrease PM₁₀ concentration in neighboring countries, such as actions to reduce industrial emissions to air, alternative energy sources such as solar cooking and electrical heating, and appropriate health and environmental monitoring are recommended. Considering limited available prerequisite building, calculated duration of disease attributable to air pollution, and estimated health effects of air pollutants, which are epidemiological indicators, the calculation of these indicators by experts is recommended. Thus, further studies assessing the development

in health status are necessary.

Conflict of Interests

Authors have no conflict of interests.

Acknowledgments

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Family functioning in families of patients with schizophrenia and mood disorders

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Original Article

Abstract

BACKGROUND: Family functioning is one of the most important aspects of psychiatric treatment. The purpose of this study was the comparison of family functioning in family members of schizophrenic patients and patients with mood disorders in Shahrekord, Iran.

METHODS: This analytical descriptive study was conducted on family members of 186 patients diagnosed with schizophrenia and mood disorders. The data were collected through interviews using the family assessment device. Data were analyzed using chi-square, Student's t-test, Pearson correlation, and multivariate analysis of variance (MANOVA).

RESULTS: The mean total score of the questionnaire in the family members of patients with mood disorders (2.34 ± 0.26) was significantly ($P < 0.001$) lower than that in schizophrenic patients' family members (2.55 ± 0.31).

CONCLUSION: The present study highlighted that family functioning among family members of patients with schizophrenia had problems in all domains.

KEYWORDS: Family Functioning, Mood Disorder, Schizophrenia

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Introduction

Family functioning is one of the most important aspects of the treatment of psychiatric patients. Good family functioning helps family members in preserving the dimensions of communication, emotional and behavior control, problem solving, and coping behaviors.¹

Some studies have reported that good family functioning facilitated patient's recovery and reduced the risk of suicide.²⁻³ Furthermore, studies have found that family functioning in the families of psychiatric patients was lower than nonclinical control subjects.⁴

In the study by Sawant and Jethwani, relatives

of schizophrenic patients had more difficulty on the roles, general functioning, and behavior control domains in the Family Assessment Device (FAD).⁵ Unal et al. reported that the general functionality level and subscales of communication were low in families with schizophrenia, whilst behavior control was reported as highly ineffective.⁶

In addition, major mood disorders, unipolar (UP) depression, and bipolar disorders (BD), both BD I and II expressions, have high lifetime prevalence. A decade earlier, a World Health Organization (WHO) report announced that BD is more impairing than all forms of cancer, Alzheimer's disease, and epilepsy. In addition to social and personal costs, unipolar and bipolar disorders impose a range of financial costs on individuals, households, employers, and

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government and society as a whole.⁷ Families of patients with BD report lower levels of family cohesion and adaptability and higher levels of conflict than families of healthy children or population norms.⁷⁻⁹

Today, the responsibility of care has been placed on families who are the forefront of caregivers and are confronted with different problems such as fear and anxiety in relation to the patient's symptoms.¹⁰ Severe mental illness affects all dimensions of family functioning and alters family roles and relations, but family members often do not receive adequate assistance from mental health professionals.¹¹

Assessment of the patient's family functioning and their communication with each other are some of the tasks of and standards for psychiatric-mental health nursing practice.¹² There are a limited number of studies on family functioning in family members of psychiatric patients in the Iranian population. Therefore, the present study was performed with the purpose of studying family functioning in family members of patients with schizophrenia and mood disorders in Shahrekord, Iran.

Materials and Methods

This analytical descriptive study was conducted on family members of 186 patients diagnosed with schizophrenia and mood disorders between May and December 2009. The study design was approved by the Ethical Committee of Shahrekord University of Medical Sciences. Family members of patients who were diagnosed with schizophrenia and mood disorders according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) criteria and admitted to the psychiatry ward of Hajar Hospital, Shahrekord were invited to participate in this study. Inclusion criteria for the family members consist of being a healthy relative, such as parents, sibling, or spouse, of the patients, living with the patient (main caretaker of the patient), and older than 18 years of age. Written informed consents were obtained from all

participants.

In total, 186 family members participated in the study and were divided into 2 groups based on the patient's diagnosis on schizophrenia (n = 106), and mood disorders (n = 80).

Data gathering was conducted by the researcher, who was a psychiatric nurse with a master's degree. Regarding family member's condition and inability in filling the questionnaires, the researcher had to ask the questions and record their answers in the questionnaires.

In this study, a demographic questionnaire and the Family Assessment Device (FAD) were used. The demographic information questionnaire was designed by the researchers. The family members of patients were asked to give some information about their age, relationship with the patient, and the patient's age, sex, education, duration of illness, and marital status.

The FAD consists of statements about family which are scored based on a 4-point scale; completely agree, agree, disagree, and completely disagree. The FAD consists of 7 subscales with a Cronbach's alphas of 0.74 for problem solving, 0.75 for communication, 0.72 for roles, 0.83 for emotional responsiveness, 0.78 for emotional involvement, 0.72 for behavior control, and 0.92 for general functioning.¹³ All participants who were over 12 years of age were allowed to fill in the form; therefore, this questionnaire is suitable for use in this study.¹³ This questionnaire is a suitable device for clinical screening and research.¹³ In Iran, FAD was translated by Najjarian in 1995,¹⁴ and Yoosefi in 2012. The internal reliability (Cronbach's alphas) of the Persian version of FAD was 0.86 for problem solving, 0.87 for communication, 0.87 for roles, 0.81 for emotional responsiveness, 0.89 for emotional involvement, 0.87 for behavior control, and 0.82 for general functioning.¹⁵

Student's t-test was used to compare FAD mean scores between the two diagnostic groups of patient's family members. All statistical analyses were performed using SPSS (version 16,

SPSS Inc., Chicago, IL, USA) and chi-square, Student's t-test, Pearson correlation, and multivariate analysis of variance (MANOVA). All P values below 0.05 (two-tailed test) were considered significant.

Results

Characteristics of the sample

In total, 186 family members participated in the study. Regarding patients' diagnosis, 56.98% (n = 106), and 43.02% (n=80) of participants were family members of patients with schizophrenia and mood disorders, respectively. Mood disorders group consisted of 73.8% (n = 59) major depressive disorder and 26.2% (n = 21) bipolar disorder. The demographic structure of the patients showed that the mean age of patients was 38.76 ± 14.5 years and consisted of 68.4% (n = 128) men and 31.6% (n = 58) women. In addition, most of them were illiterate (89.24%). The mean duration of illness was 3.46 ± 2.17 years, and 47.32% of participants had been married. The mean age of the family members was 40.5 ± 12.37 years and 65% were women and 35% men. The majority of the caregivers were

parents or spouses of the patients. In this study, demographic characteristics (such as age of patients, duration of illness, age of caregivers, frequency of hospitalization, and relationship of caregivers with patients) were similar in both groups (Table 1), while other variables (like sex, educational level, and marriage condition of patients) were different and analyzed as confounding variables.

FAD scores

The mean total FAD score in schizophrenic and mood disorder groups were 2.55 ± 0.31 and 2.34 ± 0.26 , respectively ($P < 0.001$). In the schizophrenic group, affective involvement score (2.71 ± 0.46) and in the mood disorders group affective responsiveness (2.5 ± 0.37) was higher than other dimensions ($P = 0.001$). The Pearson correlation test demonstrated a significant positive correlation between different dimensions of FAD in each study group ($P < 0.001$). Regarding this correlation, MANOVA was conducted to compare FAD dimensions in the two study groups and Wilks's lambda statistics showed a significant statistical difference in FAD dimensions between the two study groups ($P = 0.009$).

Table 1. Demographic characteristics of family members in the two groups

		Schizophrenic group (n = 106)	Mood Disorders group (n = 80)	Total patients (n = 186)	P	
Patients	Age (year) (mean \pm SD)	39.90 ± 12.80	37.2 ± 16.5	38.76 ± 14.5	0.223	
	Sex (%)	Male	66 (61.7)	62 (77.5)	128 (68.4%)	0.026*
		Female	40 (38.3)	18 (22.5)	58 (31.6%)	
	Education (%)	Literate	5 (4.72)	15 (18.8)	20 (10.76%)	0.002*
		Illiterate	101 (95.28)	65 (81.2)	166 (89.24%)	
	Marital status (%)	Married	39 (36.80)	49 (61.2)	88 (47.6%)	0.002*
		Single or divorced	67 (63.20)	31 (38.8)	98 (52.68%)	
Duration of illness (mean \pm SD)		3.5 ± 2.4	3.46 ± 2.17	0.681		
Frequency of hospitalization (mean \pm SD)		5.9 ± 5.0	5.19 ± 4.4	6.0 ± 4.7	0.0943	
Family members	Age (year) (mean \pm SD)	42.5 ± 10.28	38.5 ± 14.47	40.5 ± 12.37	0.063	
	Relationship of caregivers with patient (%)	Parent	46 (43.40)	44 (55.0)	90 (48.39)	0.139
		Spouse	60 (56.60)	36 (45.0)	96 (51.61)	

* Significant differences

Table 2. Family Assessment Device (FAD) scores in family members of patients in the two diagnostic groups

FAD Sub-scales	Mood disorders group (mean ± SD)*	Schizophrenia group (mean ± SD)*	P
Problem solving	2.01 ± 0.39	2.36 ± 0.60	< 0.001
Communication	2.25 ± 0.32	2.40 ± 0.37	0.001
Roles	2.45 ± 0.32	2.64 ± 0.36	0.020
Affective responsiveness	2.50 ± 0.37	2.61 ± 0.35	0.064**
Affective involvement	2.45 ± 0.49	2.71 ± 0.46	0.001
Behavior control	2.41 ± 0.35	2.63 ± 0.42	0.006
General functioning	2.32 ± 0.32	2.57 ± 0.41	< 0.001
Total score	2.34 ± 0.26	2.55 ± 0.31	< 0.001

* Higher score shows lower family functioning; ** No significant differences; SD: Standard deviation

Considering confounding variables, only affective responsiveness in FAD domains had no significant difference in the two study groups ($P = 0.064$); however, the family members in the schizophrenic group had more difficulty as compared to the mood disorders group (Table 2).

Findings of the study showed that relation of caregivers with the patients, as a confounding variable, had no significant effects on the study results ($P = 0.139$).

Discussion

Taking care of a relative with serious mental illness has an emotional and practical impact on the caregivers and is associated with their physical, psychological, and financial burdens.^{16,17}

Results of the present study showed that family functioning was significantly better in the family members of patients with mood disorders than the schizophrenic patients. This finding was similar to that of the study of Unal *et al.*⁶ Nevertheless, Koyama *et al.* found no significant difference among schizophrenic, major depressive, and bipolar disorder family members using FAD.¹⁸ There is a cultural difference in stigmatization among families of psychiatric patients. In the Iranian population, among patients and their families, mood disorders are more acceptable and less stigmatized than schizophrenia. Families of patients with schizophrenia prefer to conceal the mental illness of their relatives. Therefore, this difference may be related to the level of stigmatization among caregivers of patients with schizophrenia in

different societies.

In addition, subscales of family functioning were reported as highly ineffective by the family members of patients with schizophrenia, especially in the affective involvement domain. Affective involvement refers to the amount of interest, care, and concern that family members invest in each other. The present study showed that family members of patients with schizophrenia were less able to show interest and care to one another (affective involvement), had poorer problem solving ability (problem solving), were less able to perform behaviors to fulfill the instrumental and affective needs of family members (roles), less able to transmit clear and directive verbal messages (communication), and less able to give affective response with appropriate quality and quantity of feelings (affective responsiveness). Regarding the roles of family in providing care for their members with a mental illness, they may be unable to successfully adapt to the excessive demands of the illness. Caqueo-Urizar *et al.*, in a review research on the quality of life of caregivers of patients with schizophrenia, showed that the burden of care could increase family dysfunction. In particular, economic burden could negatively affect the quality of life of caregivers in developing countries, in which there is a limited number of healthcare professionals and healthcare centers, and the cost of schizophrenia's treatment is high.¹⁹

Family environment may be a major contributing factor to critical stress levels among

patients with schizophrenia. Expressed emotion (EE) is one of the major psychosocial stressor and it has direct relation with recurrence of schizophrenia. Patients with schizophrenia living with close relatives, who have negative attitudes, are significantly more likely to relapse.²⁰

In the mood disorders group, affective responsiveness was significantly higher than other FAD dimensions. Affective responsiveness assesses the ability of family members to respond with appropriate quality and quantity of feeling to a wide range of stimuli. Heru et al. examined the quality of life of caregivers of hospitalized relatives with mood disorders.²¹ Caregivers reported poor social, physical, and emotional and family functioning in the areas of roles, communication, and affective involvement.²¹ However, in the study of Unal et al., the families of patients with bipolar affective disorder evaluated their problem solving and general functioning as problematic.⁶ These results are consistent with that of previous research which demonstrated that families of depressed patients manifest impairment in different areas of family functioning.²²

The family plays different roles in the treatment process, course of the illness, and relapse prevention. Effective family functioning is important to the well-being of the family as a whole. Evidently, having a patient with severe psychiatric disorders, such as schizophrenia, could affect the family members. A primary goal of nursing practice for these families is empowering the families by recognizing their strengths, resources, and adaptive capabilities. Nurses can assist the families in working with their strengths and inner resources as well as their personal limitations in managing the illness.²³ Mental health nurses, have the ideal opportunity to assist the families to promote their effective coping behaviors, communication skills, and social support systems, satisfactory interpersonal relationships, and active decision-making skills. Nursing interventions that specifically strengthen daily coping, adaptation,

caregiver health condition, and quality of life for families living with severe mental illness are potentially powerful fields for psychiatric nursing research.¹² Therefore, nurses and other treatment team should focus not only on caring for patients with severe psychiatric disorders like schizophrenia, but also managing the problems of family members living with these patients.

Conclusion

The present study highlights poor family functioning among caregivers of patients with psychiatric disorders specially schizophrenia. This may be due to the presence of emotional distress and frustration related to taking care of these patients. Psychiatric nurses and other treatment team must remember that the family and friends are major support systems for their loved ones with schizophrenia and other psychiatric disorders and the promotion of family involvement in all steps of the treatment process and the respectful treatment of families are essential to the welfare of the family as a cohesive unit.

The study had some limitations. The sample size was small and we did not employ a non-clinical control group. Comparison between parents and spouses among the caregivers would also provide additional insight into the discrepancy of perception among the family members as well as the patient population.

Conflict of Interests

Authors have no conflict of interests.

Acknowledgments

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Kikuchi-Fujimoto disease in a young female with discoid lupus and alopecia

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Abstract

Case Report

Kikuchi-Fujimoto disease is an uncommon, benign, autoimmune condition characterized by lymphadenopathy, fever, and neutropenia. It is a self-contained condition of unidentified etiology. A 38-year-old female of Iranian Kurdish origin referred to us with multiple neck swellings, fever, and generalized arthropathy. There was no weight loss and no history of tuberculosis, medication intake, or allergy. Clinical examination revealed bilateral large, mobile, and tendercervical lymphadenopathy. Cardiovascular, respiratory, and neurological examination was normal. The patient had leucopenia and thrombocytopenia. Kikuchi-Fujimoto disease must be considered in the differential diagnosis of a female patient with fever and cervical lymphadenopathy.

KEYWORDS: Kikuchi-Fujimoto Disease, Lymphadenopathy, Alopecia

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Introduction

A benign and rare disease named Kikuchi-Fujimoto disease (KFD) was described for the first time by Kikuchi and Fujimoto independently in 1972.¹ Currently, the disease is well recognized. It is an uncommon cause of lymphadenopathy, mainly affecting young women. In spite of many reports and studies, the etiology of this disease is indistinct. Some initial reports hinted at *Yersinia enterocolitica* and *Toxoplasma gondii* as possible causative agents of KFD; however, viral or autoimmune factors may also be involved in the disease process.² The disease manifests itself with cervical lymphadenopathy, fever, or flu-like symptoms. Malaise, weight loss, loss of appetite,

nausea, vomiting, diarrhea, chest pain, splenomegaly, and hepatomegaly are also included in the presentation of the disease. Laboratory tests include having elevated erythrocyte sedimentation rate (ESR), anemia, neutropenia, and lymphocytosis.³

The diagnosis of KFD is made through histopathologic features of the lymph node. On the other hand, morphological features may suggest systemic lupus erythematosus (SLE), non-Hodgkin lymphoma (NHL), and reactive lymphadenopathy. Therefore, for the differential diagnosis of KFD, it is appropriate to attempt to heighten awareness of the disease, especially in otolaryngologists and experienced pathologists.⁴⁻⁶

Case Report

A 38-year-old female of Iranian Kurdish origin

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referred to us with multiple neck swellings, fever, and generalized arthropathy. There was no weight loss, and no history of tuberculosis or contact with patients with tuberculosis. The patient had no history of any medication intake, allergy, or any other background medical conditions, except for a history of renal stone and dysuria. Clinical examination revealed bilateral, large, mobile, and tender cervical lymphadenopathy; the larger nodes being the left supraclavicular lymph node which measured about 19×5 mm as well as axillary lymph nodes which measured about 24×7.5 mm. Lymph nodes were not palpable in other parts of the body. The patient's cardiovascular, respiratory, and neurological examination was normal. The abdomen was tender with normal bowel sounds. Throat examination was also normal. Routine hematological parameters, like hemoglobin, complete blood count, and peripheral smear, showed leucopenia and thrombocytopenia (white blood cell count = 2320 mm^3 , lymphocyte = 30%, neutrophils = 53%, platelets = 113). High lactate dehydrogenase (LDH) (1202) with lymphadenopathy was suggestive of potential malignancy. ESR was 20 mm/1st hr. Blood glucose, urea, creatinine, and sodium levels were normal. Results showed normal morphology for lymphocytes with no lymphocytosis. Biopsy was taken from cervical lymph nodes. Pathology results revealed 3 clinical impressions, including lichen planopilaris, discoid lupus erythematosus, and alopecia areata; however, scalp lesion excision was compatible with discoid lupus erythematosus.

Liver function tests were normal. Blood and urine cultures were negative. Abdominal ultrasound and chest radiograph was normal. Staining for acid-fast bacilli (AFB) was also negative in the biopsy take from the lymph node as well as the sputum. In spite of 1 week antibiotics treatment, the patient continued to have fever and persistent lymphadenopathy; therefore, lymph node biopsy was obtained from the patient. Histological features suggested

necrotizing lymphadenitis consistent with Kikuchi-Fujimoto lymphadenitis (Figure 1). Skin examination showed discoid lesions and the patient suffered from hearing loss. Additionally, diagnosis of the disease was confirmed by 3 pathologists and 3 oncologists.

The patient was treated symptomatically with nonsteroidal anti-inflammatory drugs (NSAIDs) resulting in regression of the lymph nodes. Follow-up of the patient showed improvement, and after 2 years of follow-up, our patient remained asymptomatic.

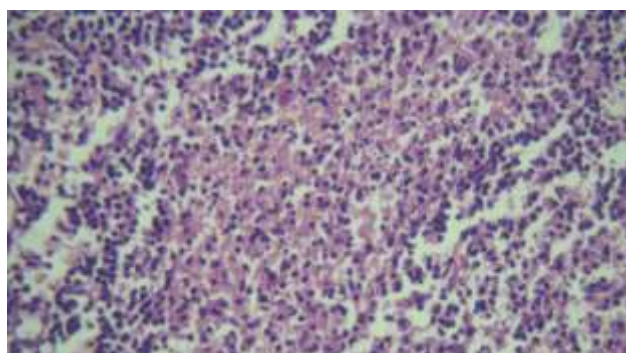


Figure 1. The affected nodes show focal well circumscribed paracortical necrotizing lesions. There are abundant karyorrhectic debris, scattered fibrin deposits and collection of mononuclear cells. Plasma cells and neutrophils are very scanty a feature of diagnostic importance. The most important differential diagnosis is with malignant lymphoma with secondary necrosis.

Discussion

The presence of lymphadenopathy always raises concern about cancer. Patients with palpable lymph nodes in the supraclavicular region are at high risk for cancer.³ Localized lymphadenopathy is common, and 55% of all cases involve lymph nodes in the head and neck, and the cervical region. In contrast, 1% of all cases of lymphadenopathy are attributed to supraclavicular lymph nodes, 5% to axillary nodes, and 14% to inguinal nodes.³ KFD is often diagnosed by cervical tender lymphadenopathy accompanied by fever, and upper respiratory tract symptoms. Less common symptoms include arthralgia, skin rash, weakness, and night

sweats.³ Other complications include weight loss, diarrhea, anorexia, chills, nausea, vomiting, chest and abdominal pain, and hepatosplenomegaly.⁷ No definite cause for the disease has been recognized as yet; however, viral agents, such as Epstein-Barr virus (EBV), human immunodeficiency virus (HIV), herpes simplex virus, dengue virus, human T-lymphotrophic virus (HTLV), and parvovirus B19, have been suggested as possible etiological agents.⁸ Toxoplasma and other bacterial agents, like *Yersinia enterocolitica*, *Bartonella*, and *Brucella*, have also been considered. KFD sometimes presents in conjunction with SLE; thus, the involvement of autoimmune mechanism has also been suggested.² There are several reports suggesting an association between KFD and SLE. However, no convincing evidence is available to confirm this relationship and the pathogenesis of KFD is unclear.²

Clinically, KFD may mimic SLE or lymphoma (especially T-cell non-Hodgkin lymphoma) as both these diseases can present with lymphadenopathy and fever, and the skin lesions of patients with KFD can resemble those seen in patients with SLE. Therefore, Histopathologic examination will help us distinguish KFD from other diseases.²

The histological feature which helps in the differentiation of KFD from lymphadenopathy of SLE is almost total absence of plasma cells in the involved nodal tissue. Moreover appropriate serologic tests should be conducted to exclude SLE. Features that distinguish KFD from malignant lymphoma include incomplete architectural effacement with patent sinuses, presence of numerous reactive histiocytes, relatively low mitotic rates, absence of Reed-Sternberg cells.⁹

No specific treatment is available for KFD as yet. Treatment is generally symptomatic. nonsteroidal anti-inflammatory drugs (NSAIDs) may be used to alleviate lymph node tenderness and fever.¹⁰ Use of corticosteroids has been recommended in severe forms of the disease. Intravenous immunoglobulin has also been tried

with relative success. The disease usually runs a benign course and the condition is self-contained, usually subsiding after several weeks to months with a recurrence rate of 3 to 4%.⁹ The disease is an uncommon cause of lymphadenopathy. Because patients with lymphadenopathy refer to different physicians, the disease should be recalled and ruled out. The distinctive feature of our case was the diagnosis of discoid lupus together with alopecia.

Conclusion

KFD is rare; however, when a young female patient refers to us with fever and cervical lymphadenopathy KFD must be considered among the differential diagnosis. Clinically, the disease may resemble lymphoma or SLE. Therefore, a careful histopathological examination is essential for an accurate diagnosis. Moreover, early diagnosis of the disease is crucial to avoiding costly, painful, and pointless evaluations or treatments.

Conflict of Interests

Authors have no conflict of interests.

Acknowledgments

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Magnetic resonance spectroscopy in the management of tophaceous gout: A case report

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Abstract

Development of chronic tophaceous arthritis with marked joint impairment may follow repeated acute attacks. We present a 60 year-old man with huge urate deposits and severe gouty arthropathy with underlying hypothyroidism. During the past years, he had undergone several surgeries with different degrees of amputation to remove the tophus. Magnetic resonance spectroscopy (MRS) of foot finger revealed high peak of lactate, suggesting that high lactate levels is linked with chronic gout and frequent attacks. The patient was treated with levothyroxine along with gout medication, and his thyroid-stimulating hormone (TSH) and urate levels were soon normal, suggesting that the underlying hypothyroidism had aggravated his gout condition.

KEYWORDS: Gout, Urate, Magnetic Resonance Spectroscopy, Tophaceous Gout

Case Report

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Introduction

Gout is a metabolic disease that can manifest as acute arthritis or chronic arthropathy, which is also called tophaceous gout, and deposition of monosodium urate crystals in joint, bones, connective tissue, and kidneys.^{1,2} All patients with gout have hyperuricemia at some point of their disease, and this elevated uric acid levels are linked with urate crystal formation, which is the underlying pathology for gout.³

Development of chronic tophaceous arthritis with marked joint impairment may follow repeated acute attacks and this might be aggravated with existing comorbidities such as thyroid problems. Some studies have shown that

untreated thyroid disorders may promote hyperuricemia as thyroid hormone increases serum urate levels through regulation of glomerular filtration rate.⁴

Many studies have shown that certain imaging techniques are useful in detecting urate deposition even prior to the first clinical symptoms, and thus, can be used to evaluate the extent of deposition and provide objective measurement of crystal depletion during urate-lowering treatment.⁵ Magnetic resonance spectroscopy (MRS), however, has never been used in this regard. We present a patient with huge urate deposits and severe gouty arthropathy resistant to treatment.

Case Report

A 60-year-old man came to our attention as a

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resistant case of tophaceous gout. He had been diagnosed with gout several years ago and had been treated with allopurinol 100 mg/day and colchicine 0.5 mg/day for a long time. On laboratory examination, slightly elevated uric acid (10.6 mg/l) was attributed to untreated hypothyroidism. In addition to hypothyroidism, he had a positive history of ischemic heart disease and mild hypertension. Cardiac stress test had revealed mild stress-induced ischemia in apex. He had a normal left ventricular ejection fraction of 50% associated with trivial mitral and tricuspid regurgitation in echocardiography. Coronary angiography detected one-vessel disease (1-VD). He was, thus, treated with various anti-hypertensive drugs.

During the course of many years, he has had multiple acute gout flares, resulting in the development of multiple tophi localized to his feet. He had undergone several surgeries because of these tophi, which resulted in the amputation of his right big toe. As for his left foot, similarly, the tophus located on the lateral malleolus was excised. In a recent surgery, a tophus on the dorsal aspect of the extensor tendon extended to the plantar surface was excised as possible. The very tophus had caused erosion of second to fifth metatarsal bones to some extent; however, none of them were fractured.

He was noted to have a multilobular, solid, tender, enlarged subcutaneous nodule of the distal metatarsal of right big toe, causing severe deformation (Figure 1). There was also a small tophus on his right ear. The tophus on the big toe had progressively increased in size and had limited his movements to the point that he could barely walk unaided. He was told that at this stage no medication or surgery could help him. Physical examination disclosed an obese man, with no goiter, and marked deformities of feet.

Laboratory evaluation revealed a serum uric acid level of 10.6 mg/dl. Erythrocyte sedimentation rate had increased to 37 mm/h. Serum creatinine was 1.36 mg/dl and fasting blood sugar was 107 mg/dl. Urinary protein was

2.28 g/day. Thyroid-stimulating hormone (TSH) was 40.1 μ UI/ml, T4 and T3 were 1.7 ng/dl and 0.7 pg/ml, respectively. Liver function test was also performed, and the results were unremarkable. Kidney ultrasound and cardiac echocardiography did not identify any uric acid deposition.



Figure 1. Multilobular, solid, tender, enlarged subcutaneous nodule of the distal metatarsal of right big toe (a) X-ray (b)

Considering the unusual size of the tophus and its resistant nature, diagnostic arthrocentesis was performed and yielded white, chalky particulate material. Light microscopy of Hematoxylin and Eosin-stained smears disclosed amorphous material (urate crystals) surrounded by inflammatory giant cells on histopathologic examination (Figure 2). Calcium-containing compounds or apatite crystals were not found.

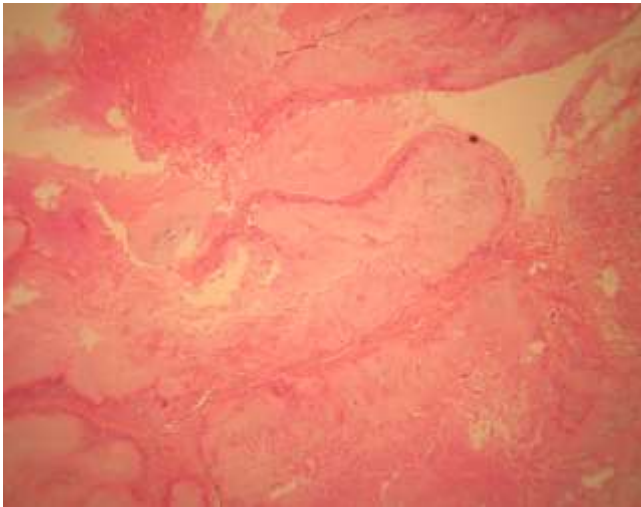


Figure 2. Hematoxylin and eosin-stained smears disclosed amorphous material (urate crystals) surrounded by inflammatory giant cells on histopathologic examination

The radiographic examination of the feet showed eccentric soft tissue thickening in the absence of any calcifications or ossifications and

well-defined intra- and extra-articular bone destruction. The first metatarsophalangeal joints of the feet seemed to have disappeared. Tars metatarsal joints of the third, fourth, and fifth rays were also destroyed.

These findings led to magnetic resonance imaging (MRI) studies, obtained with a 1.5 T magnetom (Siemens, Munich, Bavaria, Germany), which revealed a well-defined soft tissue abnormality of intermediate signal on T1 weighting and of intermediate to low intensity on T2 weighting (Figure 3). In the obtained images, there was soft tissue expansion containing tiny calcified tophi adjacent to distal phalanx of toe without evident bony destruction. On the obtained multiplanar MR images of right foot, there was soft tissue expansion with low signal in T1 and high signal in T2 weighted images without evident phalangeal destruction.

The MRS of toe revealed high peak of lactate in the 1 ppm region of curve (Figure 4). Cho-Cr and NAA levels were in normal range.

Due to his huge urate deposits, allopurinol dose was gradually increased to 200 mg/day with prophylactic colchicine. Low dose indomethacin was also prescribed to reduce marked joint inflammation. He was initially treated with thyroid hormone (25 µg/day), which was gradually increased to 200 µg/day, based on TSH levels. As a result, serum TSH and urate progressively decreased to normal levels.

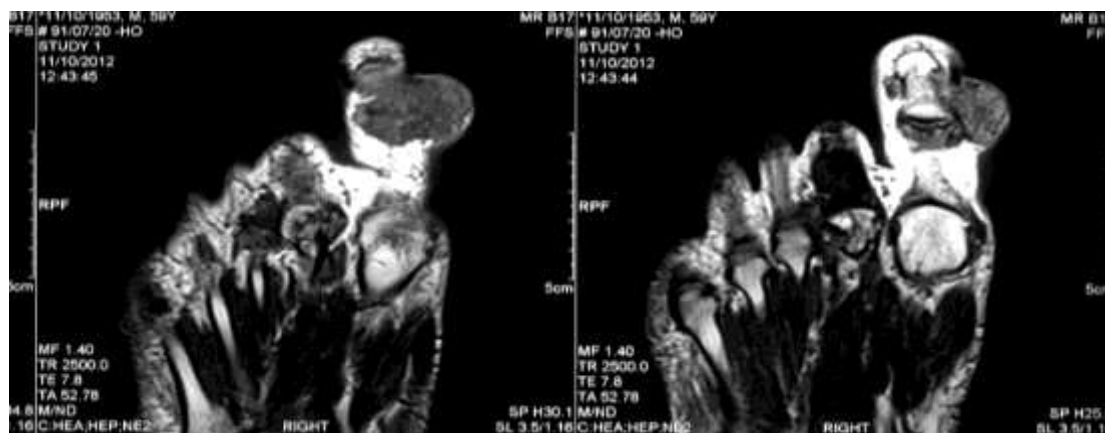


Figure 3. Magnetic resonance imaging (MRI) of right foot

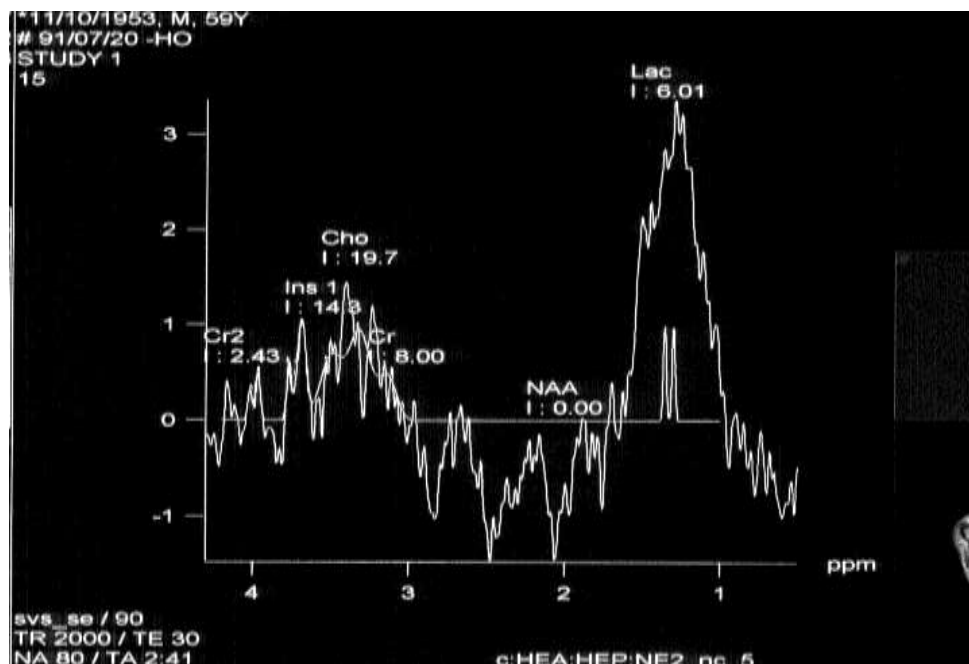


Figure 4. Magnetic resonance imaging (MRS) of right toe

Discussion

Gout, one of the several crystal arthritides, is caused by persistent chronic hyperuricemia. It is characterized clinically by relapsing and remitting attacks of joint pain and swelling, usually monoarticular, and monosodium urate crystal deposition (tophi), typically found in and around joints on fingers, toes, wrists, and knees, on the olecranon bursae, on the Achilles tendons and rarely on the helix of the ears, the sclerae, subconjunctivally, and on the cardiac valves.⁶⁻⁸

The development of these chalky-appearing tophaceous deposits generally occurs several months to years after the episodic arthritic attacks and may not be recognized by the patient as soft-tissue tophi and may be painless and nontender.⁹

Gout can coexist with many diseases such as thyroid problems.¹⁰ Both hyperthyroidism and hypothyroid states are reported to be associated with gout and hyperuricemia.¹¹ Many studies have linked long-standing hypothyroidism with several biochemical abnormalities, including increased serum creatinine and uric acid levels.¹² Hyperuricemia, in these cases, is believed to be

secondary to increased production due to myopathy associated with hypothyroidism or decreased renal plasma flow and impaired glomerular filtration.¹³ High TSH levels were similarly a complicating factor in our patient. In our patient, similarly, treating the underlying hypothyroidism was associated with reduced uric acid levels (serum uric acid = 9.4 mg/dl; urine uric acid = 250 μ mol/l). This illustrates the need to screen patients with gout and even asymptomatic hyperuricemia and joint pain for underlying hypothyroidism.

Generally, the clinical diagnosis of gouty tophus is easily rendered, even in the absence of pathologic material, if the classic clinical and radiologic features are present. Fine-needle aspiration biopsy (FNAB) can be extremely helpful and yield diagnostic findings in distinguishing gout from pseudogout. Polarizing microscopy using red filter is, therefore, necessary to establish a correct diagnosis.¹⁴ Histopathologic studies, on the other hand, show aggregates of urate crystals with surrounding macrophages, lymphocytes, and giant cells.¹⁵

The radiographic features of gouty arthritis

including soft tissue swelling, bony erosion, and solid soft tissue masses (tophi) are not entirely specific and may be seen in a variety of benign and malignant disorders.^{16,17} Calcifications as well as ossification may be present.

Traditionally, tophi was detected and monitored by palpation, or by standard radiography or ultrasonography. Reports suggest that radiography may underestimate the size of and extent of soft tissue and osseous tophi, while a recent ultrasonography study characterized tophi as compared to nodules or lipomas and cysts.^{18,19} MRI has been shown to be a more sensitive, accurate, and reproducible technique to measure tophus volume and consequently monitor the efficacy of long-term urate-lowering therapy in patients with tophaceous gout.^{20,21}

Although the evaluation of tophi using FNAB, CT-scan, ultrasound, and MRI has been described as a potential diagnostic aid, to our knowledge, there is no report of MRS in this regard. MRS is a noninvasive diagnostic test for measuring biochemical changes in different tissues. While MRI identifies the anatomical location of a mass, MRS compares the chemical composition of normal tissue with abnormal tissue. This test can also be used to detect tissue changes in different diseases. There are several different metabolites or products of metabolism that can be measured to detect the chemical composition of a tissue; amino acids, lipid, lactate, alanine, n-acetylaspartate (NAA), choline, creatinine, and myo-inositol. Choline (Cho) is the precursor to acetylcholine and cell membrane components. In MRS, it is a marker of cellular membrane turnover and is, therefore, elevated in neoplasms, demyelination, and gliosis. Creatinine (Cr), which is commonly found in metabolically active tissues (brain, muscle, heart), is important in storage and transfer of energy. The creatinine level tends to be maintained at a relatively constant level, and thus, is predominantly used as a convenient internal standard. NAA is an acetylated amino acid which is found in high concentrations in

neurons and is a marker of neuronal viability. The reduced NAA levels show the processes that destroy neurons. Lactate (Lac) is the marker of anaerobic metabolism (no peak is seen in normal spectra). It is, therefore, elevated in necrotic areas, infections, and inflammatory infiltrates. The high lactate peak in our patient illustrates the inflammatory nature of the mass.

Conflict of Interests

Authors have no conflict of interests.

Acknowledgments

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The causes of consent to and refusal of organ donation by relatives of brain dead patients in Chaharmahal and Bakhtiari Province, Iran; A letter to the editor

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Letter to Editor

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Editor in Chief

The need for organ donation has increased during the last two decades,¹ while the rate of consenting to organ donation has remained insufficient worldwide.² Research has indicated that the most important reason for restricted accomplishment in organ donation is lack of consent of the deceased's relatives.^{1,3} In most countries, the process of organ donation depends on the decision of the deceased's relatives on organ donation and this decision is strongly influenced by numerous factors.⁴ Some Iranian individuals do not have a positive attitude towards organ donation.

In the present study, the reasons for consent to and refusal of organ donation were examined in 102 family members of brain dead patients hospitalized in hospitals of Chaharmahal and Bakhtiari Province, Iran, from 2003 to 2013. About 37% of families had consented to organ donation. In the refusing group, failure of belief in brain death as actual death (72.9%), belief in the painful process of organ donation (60.4%),

and uncertainty about the physician's diagnosis (75%) were the most frequent reasons for refusing. In the consenting families, belief in beneficence and religious belief in oblation (100%), and certainty about the treatment team's efforts to save the patient (100%) and physician's diagnosis (100%) were the most frequent factors.

Siminoff et al., found that the majority of consenting individuals expressed altruism as the reason for their decision.⁵ In addition, the patient's tendency towards organ donation was one of the important reasons for their consent. In the refusing families, the possible lack consent of the patient was one of the most important reasons for refusal of organ donation.⁵ Ahmadian et al. also found religious beliefs and ideas on transplantation as predictors of decision on organ donation.⁶ Ghorbani et al. also found failure to acknowledge brain death, cultural issues, unspecified organ receiver, and unawareness of the deceased individual's consent to or refusal of organ donation to be the most common causes of organ donation refusal.⁷

Moraes and Massarollo, in their qualitative study, concluded that brain death was considered as uncertain by family members, and its denial, conflicts among family members

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during the decision making process, and bereavement and grief caused by a beloved individual's death contributed to organ donation evasion.⁸ Holman et al., in a study in Romania, found maintenance of body integrity after death to be the an effective factor on refusal of organ donation.⁹

Numerous factors are related to the consent to or refusal of organ donation by relatives of brain dead patients and special attention to these factors is necessary in order to increase the organ donation rate.

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Conflict of Interests

Authors have no conflict of interests.

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Socioeconomic inequalities of hypercholesterolemia in Kurdistan Province, Iran, in 2005

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Health Care System

Abstract

BACKGROUND: Hypercholesterolemia is one of the main risk factors for many non-communicable diseases (NCDs). Many deaths caused by hypercholesterolemia usually occur in low and middle income countries. The aim of the present study was to determine the socioeconomic inequality in the distribution of hypercholesterolemia in Kurdistan Province, Iran, in 2005.

METHODS: The data used in this study were obtained from the results of the Non-Communicable Disease Surveillance Survey (NCDSS) conducted in 2005 in Kurdistan Province. In this study, the socioeconomic status (SES) of participants was determined based on their assets and residential location and using the principal component analysis (PCA) statistical method. The levels of inequality in 5 different socioeconomic groups were determined by calculating the concentration index, comparing odds ratio (OR), and through using logistic regression method.

RESULTS: The prevalence of hypercholesterolemia in the studied subjects was 38.5% [confidence interval (95% CI): 36, 41]. The concentration index of hypercholesterolemia was -0.031 (95% CI: -0.070, 0.009). Moreover, the OR of hypercholesterolemia in the richest group, compared with the poorest, was 0.82 (0.59 to -1.13).

CONCLUSION: In this study, the relationship between socioeconomic status and risk of hypercholesterolemia was not statistically significant; however, usually, SES is associated with hypercholesterolemia. In the comparison of different countries, distribution of hypercholesterolemia in different SES levels depends on the level of development, gross national product (GNP) per capita, and level of income in each country. Inequalities in the distribution of risk factors for hypercholesterolemia can be reduced through increasing disadvantaged groups' access to health care services and planning special programs for inequality reduction.

KEYWORDS: Inequality, Hypercholesterolemia, Socioeconomic status, Iran

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Introduction

Hypercholesterolemia is one of the main risk factors for non-communicable diseases (NCDs). The majority of deaths from hypercholesterolemia usually occur in low and middle income countries.^{1,2} Hyperlipidemia is a collection of heterogeneous disorders, which are caused due to a buildup of cholesterol or an increase in

triglycerides. It is classified into two categories of hereditary and non-hereditary. The non-hereditary type is usually a secondary complication caused by reasons such as diet, alcohol consumption, estrogen therapy, and diseases such as diabetes mellitus, hypothyroidism, and nephritis.³

Dyslipidemia plays a major role in the development of atherosclerosis. Reduction of plasma lipid concentration plays an important role in reducing the incidence of cardiovascular disease.⁴ Increased level of cholesterol is an

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important risk factor for metabolic syndrome. About a quarter of the world's population are suffering from this syndrome. People with the syndrome are at a five times higher risk of diseases such as diabetes and are at a higher risk of cardiovascular diseases.⁵ Increased consumption of fatty foods raises the cholesterol level, which in turn adds to the risk of diseases caused by hypercholesterolemia.⁶

Determining the distribution of health outcomes among subgroups can help to improve equity in health. Today, the issue of equity in health is accepted as a moral principle and a fundamental right of individuals. Accordingly, all people, regardless of their socioeconomic status (SES), should have access to an acceptable level of health.⁷

This perspective has been strengthened and highlighted in recent years. For more than a decade, experts and international organizations, such as the World Health Organization (WHO), have recommended efforts to better understand the health status of communities. The determination of not only the level of health indicators, but also the distribution of health outcomes is necessary in different subgroups. The focus on health inequalities in recent years has resulted in a greater emphasis on the determination of inequalities in health indices. Accordingly, this subject has become very popular and many health and management professionals, sociologists, and epidemiologists have paid special attention to it. For the same reasons, the measurement of inequalities in health status and determination of the role of SES in health have received much attention in recent years. Although some countries have followed the recommendation about the determination of health inequalities in health outcomes, many countries still have not taken any action in this field.⁸⁻¹⁰

Measurement of changes in health inequality indices not only helps to determine the SES of each sub-group at each stage over time, but also can determine the effects of social changes and

policies designed to reduce inequality. In fact, if our aim is to provide equity in health, we should be able to measure the impact of our activities over time.¹¹

From an applied perspective, determining the level of inequality in risk factors for NCDs, such as hypercholesterolemia, can help authorities adopt appropriate policies to improve social equity in community health. Additionally, it can direct interventions so that by using fewer resources a larger number of NCDs can be controlled in the community. The results of this study can help policymakers to incorporate some objectives in health programs to reduce inequalities and ensure equity in health. Hence, the aim of the present study was to determine socioeconomic inequality in the distribution of hypercholesterolemia in Kurdistan Province, Iran, in 2005.

Materials and Methods

This was a cross-sectional population-based study, which was conducted via a descriptive and analytical method. The data used in this study were obtained from the results of the Non-Communicable Disease Surveillance Survey (NCDSS) collected in 2005 in Kurdistan Province. Data were collected using a questionnaire and based on a stepwise guide published by the WHO.¹²

The studied population consisted of residents of Kurdistan Province aged 15 to 64 years. A total of 2494 individuals participated in this study. The sampling frame consisted of all households in Kurdistan Province. The sampling frame (i.e., household) was defined as the number of people who were living together in a residence and had common expenditures.

In this study, we used cluster sampling method; moreover, we used one-step random clustering method for different clusters. In addition, postal code was determined as the sampling framework. To set up each cluster, the core members of each cluster were selected based on their 10-digit postal code. In every city,

a cluster consisted of one or more blocks or parts of a block. Blocks were usually formed by a series of interlocking buildings that were limited to an alley or a street, boulevard, square, market, police station, mountain, river, or wasteland. First, the core member of each cluster (i.e., a household) was determined, and then, researchers started their survey from the first household and moved toward the right neighborhood. Using C index and C curve, the level of inequality was calculated. The concentration index values range between -1 and 1. This is interpreted as follows: if the curve is above the equality line, the concentration index ranges between 0 and -1 and it indicates the distribution of risk factor among poor individuals. On the contrary, if the curve is below the equality line, the concentration index ranges between 0 and 1 which indicates the distribution of risk factors among the rich individuals.^{13,14} Using the principal component analysis (PCA), participants' SES was determined based on their assets and residential location. In this study, in addition to the concentration index, logistic regression and odds ratio (OR) were also used to determine socioeconomic inequalities between different groups. The poorest socioeconomic group was selected as the base group, and other groups were compared with that base group. To determine the contribution of each determinant to inequality, decomposition analysis was used.¹⁵⁻¹⁷ All analyses were carried out in STATA (version 10, StataCorp LP, College Station, TX, USA) and SPSS software (version 15, SPSS Inc., Chicago, IL, USA).

Results

A total of 2494 patients were recruited in the present study in 2005. The response rate was 99.8%. The mean age of participants was 39.08 ± 14.37 . Table 1 shows the distribution of the subjects in the 5 socioeconomic groups. Based on PCA, an asset index was calculated for each individual. On the basis of this index, the subjects were classified into quintiles, from the poorest groups to the richest group.

Based on the results of PCA, 2491 individuals were classified into five SES groups (quintiles). Accordingly, 758 individuals (30.43%) were placed in the first quintile or the poorest group, 489 individuals (19.63%) in the second quintile or the poor group, 455 individuals (18.27%) in the third quintile or the moderate group, 379 individuals (15.21%) in the fourth quintile or the rich group, and 410 individuals (16.46%) in the fifth quintile or the richest group.

The prevalence of hypercholesterolemia was 38.5%. Table 2 shows the distribution of hypercholesterolemia in different SES quintiles, which were classified based on the PCA method. In this table, the first quintile is the poorest group and the fifth quintile is the richest group. To calculate OR, the first quintile was considered as the base group, and OR of other groups was calculated based on a comparison with this group, which was the poorest group. The OR of hypercholesterolemia in the richest group to the poorest group was 0.82 (0.59 to 1.13).

The information presented in table 2 is based on the OR of each group to the poorest group; it shows inequality and its concentration index.

Table 1. Distribution of the subjects in the five socioeconomic status (SES) groups in the study conducted in 2005

Socioeconomic group	Frequency	Percentage
First quintile or the poorest group	758	30.43
Second quintile or the poor group	489	19.63
Third quintile or the moderate group	455	18.27
Fourth quintile or the rich group	379	15.21
Fifth quintile or the richest group	410	16.46
Total	2491	100

Table 2. Distribution of hypercholesterolemia in different socioeconomic status (SES) quintiles in Kurdistan in 2005

Risk factor	Variable	First group (the poorest group)	Second group (poor group)	Third group (moderate group)	Fourth group (rich group)	Fifth group (the richest group)
Hypercholesterolemia	n of each group/total n	297/674	181/400	139/334	83/214	104/268
	OR	1	0.99	0.82	0.79	0.82
	CI	-	(0.76-1.31)	(0.61-1.10)	(0.55-1.12)	(0.59-1.13)

OR: Odds ratio; CI: Confidence interval

The concentration index [C Index & confidence interval (CI 95%) for C Index] of hypercholesterolemia in Kurdistan Province in 2005 was -0.031 (CI: -0.009, -0.070). The negative concentration index indicates the higher distribution of this risk factor among the poorer groups and the positive values indicate the distribution of the risk factor among richer socioeconomic groups. According to this table, the concentration index of hypercholesterolemia in the community is not significant. There is no significant inequality in the distribution of this risk factor in the community.

The concentration index for hypercholesterolemia had gone above the equality line in the same time period and was directed toward inequality among poorer groups. This indicates that, with a slight difference, inequality was not significant

Discussion

The results of our study on inequality in hypercholesterolemia are consistent with the results of some previous studies. In our study, the concentration index (C Index & CI 95% for C Index) of hypercholesterolemia was -0.031 with CI ranging between -0.070 and 0.009; this indicates that, with a slight difference, inequality was not significant. This can be interpreted by the texts available in the literature. However, this result may be due to the small sample size and with an increase in sample size it might become significant. The distribution of

hypercholesterolemia in different socioeconomic groups depends on the development of the country, gross national product (GNP) per capita, and time.

The prevalence of hypercholesterolemia in the United States, which is a developed country, has declined from 1971 to 2002. During this period, people who were of higher SES had been more successful in decreasing their cholesterol; consequently, the inequality distribution had shifted and hypercholesterolemia had become more prevalent among poorer people.¹⁸

In the present study, hypercholesterolemia was less observed in people who were more affluent; however, with a slight difference, it was not statistically significant. This finding highlights the fact that inequality in the distribution of hypercholesterolemia in different SES groups depends on the development status, age group, access to health services, and some others factors. People living in lower socioeconomic classes, for instance those who have lower income, have less access to health care services; therefore, their cholesterol levels are controlled much later than those who are in higher socioeconomic classes.¹⁹

The prevalence of hypercholesterolemia was 38.5% in 2005. This illustrates the fact that low SES may lead to an unhealthy diet, which in turn increases the prevalence of hypercholesterolemia. With improvement in SES and changes in diet, the prevalence of hypercholesterolemia decreases significantly.^{20,21} This study revealed a high

incidence of hypercholesterolemia, and based on previous studies, increase in hypercholesterolemia can lead to an increase in the risk of many diseases, including cardiovascular disease.²²

In this study, while dividing people into different quintiles, many people were classified in the poor group. In communities with lower SES, there is higher potential for some risk factors, including hypercholesterolemia, diabetes, and high blood pressure, these risk factors, in turn, can increase the mortality rate. Such a phenomenon indicates the presence of socioeconomic inequalities.²³

Different determinants, such as education, work environment, income, and social factors, are associated with various diseases including hypercholesterolemia; they can subsequently increase the risk of cardiovascular diseases.²²

Although in this study the relationship between SES and risk of hypercholesterolemia, with slight difference, was not significant, SES is usually associated with hypercholesterolemia. If this relationship is neglected, it will not be possible to design appropriate interventions to control the risk factors. Because of the nature of the risk factors, some of them are more prevalent among groups of higher SES; however, most of them are more common in low socioeconomic groups. This may be due to their lack of access to health services to prevent and control different diseases. Accordingly, the rate of certain diseases, including hypercholesterolemia, may increase. Thus, reducing poverty, improving education, paying attention to poorer groups in health policies, increasing disadvantaged groups' access to health services, and designing special programs for this issue can decrease socioeconomic inequalities in the distribution of risk factors.

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Conflict of Interests

Authors have no conflict of interests.

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