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# Independent risk factors for failure of non-operative management in patients with splenic injury

Zubeyir Bozdag[1]*, Abdullah Boyuk[1], Ahmet Turkoglu[1], Taner Ciftci[2], Omer Uslukaya[1], Abdullah Oguz[1], Metehan Gumus[1]

## Abstract

**Objective:** It is crucial to assess non-operative management (NOM) of risk failures before it is preferred as a management option for treatment of splenic trauma or rupture. The purpose of this study is to investigate the outcome of non-operative management of splenic trauma, and to determine the independent predictive factors effecting NOM failure.

**Material and Methods:** Seventy-seven patients among all of consecutive patients admitted with splenic trauma between January 2005 and June 2015 were included in the study. The patients were divided into two groups. Group 1: Successfully treated with non-operative management, and Group 2: The failure of non-operative management. Data recorded included patient demographics, vital signs, injury mechanism, Injury Severity Score (ISS), splenic trauma grade, hematologic parameters, Glasgow Coma Scale (GCS), transfusion requirements, and length of hospital stay.

**Results:** There were 66 (85.7 %) patients in group 1, while only 11 patients (14.3%) in group 2. Mechanism of injury was blunt in seventy-one patients and, penetrating in 6 patients. ISS [Odds Ratio=1.293; 95% CI=1.045-1.601; p=0.018] and blood transfusion [Odds Ratio=2,739; 95% CI= 1.140-6,581; p=0.024] were detected to be an independent predictive factors for the failure of non-operative management. Group 1 has significantly higher hospitalization period (7.73±2.867 vs 6.67±2.289).

**Conclusions:** Non-operative management failure risk is crucial and higher in patients with high ISS and in patients who require much blood transfusion in first 24 hours. Special attention should be paid to these patients if non-operative management becomes the preferred management option.

**Key words:** Non-Operative Management, NOM, Splenic Rupture, Risk Factors

## Introduction

The spleen is one of the most commonly injured organs in abdominal trauma. Historically, the best treatment option for patients with traumatic splenic injury was splenectomy (1). Procedures for preservation of the spleen have attracted more attention since the description sepsis of post-splenectomy by Singer (2).

Developments in the intensive care units and in the field of radiology have provided an opportunity for application of spleen preservation procedures and non-operative management (NOM). Nowadays, the standard treatment choice of hemodynamically stable patients with blunt splenic trauma is NOM, although it is associated with a potential risk of failure.

The greatest advantage of NOM is the preservation of splenic function.

In many studies, 78-98% success rates for NOM have been described (1, 2, 3, 4, 5). However, many risk factors have been described in the literature that may lead to failure of NOM. Hemodynamic instability, age above 55 years, multiple organ injuries, higher splenic trauma grade, Injury Severity Score (ISS) and transfusion requirement, lower blood pressure and GCS at admission, degree of hemoperitoneum, and contrast extravasation are patient-related factors frequently reported to be associated with failure of NOM (1, 6). However, there is no consensus on the predicting factors that may lead to NOM failure.

In this study, the outcomes of splenic trauma of NOM were retrospectively investigated and determined the independent predictive factors effecting NOM failure.

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## Material and Methods

The study was conducted at the Dicle University after approval of study by the ethical committee. A total of 256 patients with splenic trauma had been admitted to our clinic during January 2005 to June 2015. Patients who received NOM treatment and met the following criteria were included in the study; hemodynamically stable, no demonstrable peritoneal irritation finding on physical examination, and no injuries on computed tomography (CT) scans requiring operative intervention. All but unstable patients were evaluated with imaging modalities like ultrasonography (US) and CT. Exclusion criteria are factors like high bleeding risk such as coagulopathy, use of anticoagulants. A total of 77 patients with splenic trauma meeting the above criteria were included in the study.

Records of these patients were retrospectively evaluated. Patient demographics, vital signs, injury mechanism, Injury Severity Score (ISS), splenic trauma grade, hematologic parameters, Glasgow Coma Scale (GCS) score, transfusion requirements, and length of hospital stay were recorded. This data was then compared between two groups which were defined as Group 1; patients were successfully treated with NOM and Group 2; patients requiring operation due to the failure of NOM. Patients were monitored closely in an intensive care unit or monitored setting. Oral intake was restricted, parenteral fluids were given, and bed rest was ordered. Immediate operation were performed when patients exhibited any abnormality requiring operative management like instable hemodynamic condition, continuing bleeding, or positive peritoneal irritation signs. American Association for the Surgery of Trauma (AAST) classification was used for grading splenic trauma (7).

### Statistical analysis

SPSS package program (SPSS for Windows 16.0, SPSS Inc. Chicago, IL) was used for statistical analysis. Chi square or Fischer's exact test was used for comparisons of percentages, while independent t-test was used for the mean values. Multivariate regression analysis was used to detect the independent factors effecting failure of NOM of splenic trauma. A $p < 0.05$ was accepted as being statistically significant.

## Results

NOM procedures were followed for a total of 77 patients. However, NOM had failed in 11 patients (14.3%), and splenectomy was performed. The clinical finding and patients' demographics are demonstrated in Table 1. Mechanism of injury was blunt in seventy-one patients, and penetration in six in injuries. Mean length of hospital stay was 6.67±2.289 for group I, 7.73±2.867 for Group II. There were no mortalities.

While patient demographics, vital signs, GCS, number of additional organ injury were not different at a statistically significant level between the groups in a univariate analysis, Splenic trauma grade, ISS, Hg levels, and transfusion requirements were different. So they entered into a multivariate logistic regression analysis. ISS [Odds Ratio (OR) =1,293; 95% Confidence Interval (CI) = 1,045-1,601; p=0.018] and blood transfusion [Odds Ratio (OR) = 2,739; 95% Confidence Interval (CI) = 1,140-6,581; p=0,024] were determined to be independent predictive factors for the failure of NOM (Table 2). Length of hospital stay was significantly higher in Group 1 than in Group 2 (6.67±2.289 vs 7.73±2.867).

**Table 1**: Comparison of demographic and clinical characteristics of the patients

| | Group 1(NOM) (n = 66) | Group 2 (NOM failure) (n = 11) | P value |
|---|---|---|---|
| Age (years) | 30.86±11.124 | 30.91±14.543 | 0.484 |
| SBP(mmHg) | 112.27±13.103 | 100.91±11.362 | 0.271 |
| ISS | 5.64±3.728 | 15.36±6.652 | 0.018 |
| GCS | 13.88±1.504 | 13.55±1.508 | 0.167 |
| Grade of splenic injury n (%) | | | |
| I | 20 (30.3%) | 0 | |
| II | 35 (53%) | 1(%9) | <0.0001 |
| III | 7 (10.6%) | 5 (45.5%) | |
| IV | 4 (6.1%) | 5 (45.5%) | |
| Hgb (g/dL) | 12.58±1.683 | 10.21±1.600 | 0.699 |
| Blood transfusion (IU)* | 0.62±1.212 | 2.82±0.751 | 0.024 |
| EAI | 23 (34.8%) | 6 (54.5%) | 0.314 |
| IAI | 27 (40.9%) | 6 (54.5%) | 0.515 |
| LS(days) | 6.67±2.289 | 7.73±2.867 | 0.001 |

*SBP: Systolic blood pressure, ISS: Injury Severity Score, GCS: Glasgow Coma Scale, EAI: Extraabdominal organ injury, IAI: Intraabdominal organ injury, LS: Length of Stay in Hospital *Within first 24 hours*

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**Table 2**: "Binary Logistic Regression" to detect predictors for the failure of non-operative treatment

| Variables | Odds Ratio | 95% Confidence Interval (Lower-Upper) | p Value |
|---|---|---|---|
| ISS | 1.293 | (1.045-1.601) | 0.018* |
| Grade of splenic injury | 1.042 | (0.064-17.005) | 0.977 |
| SBP(mmHg) | 0.952 | (0.851-1.065) | 0.388 |
| Hgb levels | 0.853 | (0.381-1.909) | 0.699 |
| Blood transfusion | 2.739 | (1.140-6.581) | 0.024* |

*ISS: Injury Severity Score SBP: Systolic blood pressure.*
**ISS and blood transfusion was significant independent predictive factor for non-operative management.*

## Discussion

The NOM of splenic trauma has gained increasing acceptance in adults recently [8]. The benefits of NOM of splenic trauma include the followings: preservation of splenic function, avoidance of overwhelming post-splenectomy sepsis, avoidance of potential postsplenectomy thrombocytosis and avoidance of the risks associated with nontherapeutic laparotomy [9]. It is critically important to predict in which patients NOM will fail. However, the absence of a consensus regarding which patients NOM should be administered requires further study. A positive correlation was founded between the splenic trauma grade and NOM failure in many studies (1, 10, 11, 12, 13).

217 patients were identified splenic trauma grade of 3 or higher on CT as an independent predictive factor for failure of NOM by Velmahos et al (14). However, it was reported that trauma grade was not identified as a predictive factor for failure of NOM 815). We found the correlation between splenic trauma grade and NOM failure to be statistically significant but the splenic trauma grade was detected not to be predictive factor for NOM failure our study. We attribute this to the bias we have as we were inclined to administer NOM on lower grades of splenic trauma.

There is no consensus in the literature regarding the relationship between NOM failure rates and the number of blood transfusion requirements. In a study, more than 1 IU of RBC transfused was identified as predictive factor for failure of NOM [14]. Velmahos et al [14] also identified the higher failure rate in patients who were transfused more than 1 IU of RBC. Also, Sartorelli et al. (16) proposed that the failure rate is higher in patients who received more than 4 IU of RBC. Boyuk et al (10) proposed that the failure rate is higher in patients who received more than 2 IU of RBC. Hsieh et al (17) reported that patients with a low hemoglobin level at admission and a high number of transfusion requirement in the intensive care unit were predictive for NOM failure.

In the review of Olthof et al. (1), no evidence was found between hemoglobin/hematocrit levels and predictive factors for NOM failure in patients with blunt splenic trauma. In our study, the rate of NOM failure was higher in patients who required more than 2 IU of RBC in first 24 hours.

NOM is not proper management option in elderly patients, especially 55 years and over (18,19, 20). Rodrigeus et al (21), proposed that contraction and retraction of intra-parenchymal vessels are limited due to less elastic splenic capsule with increasing age. Failure of NOM may occur due to restricted splenic distention in the spleens of the elderly (10). In the report of Renzulli et al. (22), where they investigated the factors leading to NOM failure in patients with blunt splenic trauma, age over 40 years was the only independent predictive factor for failure of NOM. Whereas, age was not found to be limiting factors for NOM administration in many other studies (11, 12, 13, 14). Similarly, we also found age to not be a factor leading to NOM failure.

In the past, patients with altered mental status were not treated conservatively because of overlooked intra-abdominal injuries that might require laparotomy. According to Pal [24] the CT scans represent a very effective diagnostic method for hemodynamically stable patients with altered mental status. In our study GCS was not different between the two groups. In eight studies, where Systolic Blood Pressure (SBP) was analyzed (11, 14, 17, 19. 24, 25, 26, 27), only one study determined a correlation between failed NOM and statistically significantly lower SBP in admission (12).

Rosati et al (9) reported patients managed by immediate splenectomy had a significantly lower SBP as compared with those managed by NOM. The proportion of patients who presented with an SBP of <90 was also significantly higher in the group managed by immediately splenectomy. There was no difference between SBP of two groups compared in this study.

In review of Olthof et al. (1), ISS was found to be a strong prognostic factor for failure of NOM in patients with traumatic blunt splenic trauma. ISS was suggested as an independent predictor of failure by Bee et al. (27) and Malhotra et al. (29).

Velmahos et al. (14) observed a higher mean ISS in patients with NOM failure. ISS of greater than 25 was statistically significant in a univariate analysis. However it was not an independent predictive factor in multivariate analysis. It was demonstrated that patients who failed NOM were more likely to have 25 or higher ISS values (1). In the study of Rosati et al (9), patients undergoing immediate splenectomy had a higher ISS as well as higher morbidity and mortality rates compared to patients successfully managed non-operatively. In our study, ISS was found to be an independent predictive factor for failure of NOM.

Gender is not considered as an important factor for NOM failure in the literature. However, one study determined a higher NOM failure in men (11). Gender was not found to be a predictive factor in our study.

Although NOM approaches have been considered as standard of care in hemodynamically stable patients with blunt splenic trauma for a long time, it is also being increasingly utilized in patients with penetrating abdominal trauma, including the settings of solid organ injury. Despite this evolution of clinical practice in penetrating splenic trauma, safety and efficacy of NOM is not known exactly (26). In addition to blunt trauma, NOM also can be applied for penetrating traumas. Dematriades et al (30) applied it liver in 28.4% of selected patients, kidney in 14.9%, and spleen in 3.5%. In our study, seventy-one patients who suffered from blunt and, six from low-grade penetrating injuries were treated non-operatively.

Hospitalization in NOM of splenic trauma varies between 3 to 7 days, if no other injuries are present to elicit a prolonged stay (31). NOM failure increased length of hospital stay and increased mortality in selected subsets of patients (9, 32). Accordingly, NOM has shorter length of hospital stay than operative management in patients with isolated solid organ injuries (30). In contrast, the length of hospital stay of NOM group was shorter in this study.

There are no comprehensive guidelines for management and follow-up of patients who were planned for NOM in evidence-based setting (33). In the report of Renzulli et al. (22), patients with splenic trauma were admitted to an intermediate care unit the first 24–48 hours. Hemoglobin was measured per four-six hours in the first day and daily after that, and 1–7 days bed rest was recommended. Restrictions on the activities of patients after discharge varied between 4 and 12 weeks based on the grade of splenic trauma and the demand of the activity. Strict bed rest for 48–72 hours and then limited bed rest for one week were recommended by the Renzulli et al (22), and patient's injuries and status depended limitations were prescribed.

## Conclusion

Currently, NOM is the standard treatment for treating hemodynamically stable patients with splenic trauma without additional traumas which require laparotomy. We found the chance of NOM failure to be higher in patients with a higher ISS, and in patients requiring blood transfusion in first 24 hours. Special attention should be paid to these patients when they are treated with NOM approaches. Predicting NOM failure reduces the frequency of non-operative treatment failure, especially in severe splenic trauma; however, it is still necessary to perform prospective, randomized clinical investigations.

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# Relation of atherosclerosis risk factors with the number of involved coronary arteries in angiography

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## Abstract

**Introduction:** Coronary artery disease is the first leading cause of mortality in modern societies and formed the first cause of health expenditure. Male gender, diabetes mellitus, hypertension, hyperlipidaemia, family history of ischemic heart disease, personal history of ischemic heart disease, age, height, weight and smoking are the main risk factors for atherosclerosis and coronary artery diseases. Despite the abundant existing information about relation of these risk factors and atherosclerosis, there are different results regarding the relationship between these risk factors and the number of involved coronary arteries. The aim of this study is to determine the relation of these risk factors of coronary atherosclerosis with the number of involved coronary artery in angiography.

**Material and Methods:** In this cross-sectional study, a total of 300 patients during 8 months in ShahidMadani heart hospital were carried out as convenience sampling. Data was collected by questionnaire including age, sex, weight, height and body mass index, diabetes mellitus, hypertension, family history of coronary heart disease, smoking, drug addiction, occupation, place of residence and education were studied. Number of coronary arteries stenosis revealed by angiography. Data were analysed by software 17SPSS, Chi-square test, T test and ANOVA.

**Results:** A total of 300 patients with a mean age of 63.3±11.2 year were enrolled. Collected data showed that 71% were male, 33.3% smokers, 57.3% hypertensive, 30% diabetic, 27.7% with hyperlipidaemia, 70.34% obese and 14% with a family history of heart disease. Frequency of one, two and three vessel involvement was respectively 30%, 32% and 38%. There was a statistically significant relationship between ages, history of ischemic heart disease with the number of involved coronary artery. But there was no significant relationship with gender, body mass index, smoking and drug addiction, hypertension, family history of heart disease, location and education level with number of involved coronary artery.

**Conclusions:** Our study showed that despite the known role of conventional risk factors with the incidence and growth rate of atherosclerosis, but there is no direct correlation with some of these risk factors and the number of involved coronary arteries in coronary angiography

**Key words:** Coronary artery disease, Risk factors, Stenosis

## Introduction

Coronary artery disease is one of the most common diseases of our era. It is one of the most important causes of mortality and morbidity in developed and developing countries (1). The World Health Organization predicts that in the next years in developing countries, the prevalence of the disease not only will not reduce but also until 2020 the mortality rate will reach 25 million per year (2).

Each year, people in the United States were diagnosed with coronary artery disease that annually causes the death of half a million people and this statistics is more than mortality of cancer, accidents and diabetes mellitus in this country (3,4,5).

Cardiovascular disease, with a prevalence of 39% is considered the first cause of mortality in Iran. Studies showed between 900 to 1,200 people die each month in Tehran due to heart disease (6, 7, 8).

Coronary artery disease is not only affecting mortality, but also can lead to disability, handicap, loss of productivity, poor quality of life; impose high expenditures and many social problems (9, 10). The costs associated with this disease in the United States is estimated about four hundred billion dollars (11). With increasing prevalence of coronary heart disease, factors that could affect incidence and mortality of these diseases come calling attention to the researchers.

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The results of this research led to a number of factors were known as cardiovascular risk factor including some social, environmental and behavioural factors that may increase the risk of atherosclerosis (12).

Framingham studies showed that coronary artery disease does not occur completely random and high-risk individuals can be detected based on number of some risk factors before the onset of clinical symptoms and concluded that a combination of these risk factors increased the risk of coronary heart disease (13). Hypercholesterolemia leads to atherosclerosis plaque formation and accumulation of these plaques cause narrowing of the coronary arteries and causes heart attack (14, 15). Cigarette smoking is one of the main preventable risk factors in the US and is allocated one-fifth of deaths from cardiovascular disease. Also, there are nearly 37 million deaths from cardiovascular disease in non-smokers due to contact with smokers (passive smokers). Clinically, smoking reduces high-density lipoprotein (HDL) and increases very low-density lipoprotein (VLDL) and blood glucose levels. After quitting smoking, the risk of cardiovascular disease can decrease up to 50 percent, and within 15 years the mortality due to cardiovascular disease will be similar to non-smokers (16, 17). The influence of drugs is not fully expressed in various studies, but some research showed that medication is effective on some risk factors for coronary heart disease (18).

Diabetes mellitus is one of the risk factors for cardiovascular disease (19). Diabetes is not only involved in the development of coronary artery disease, but also plays a role in various other diseases (20, 21). In many studies, hypertension is one of the risk factors on intensifying the coronary artery disease. Although, in some studies it has been rejected, but in general hypertension has been accepted as an important risk factor in coronary heart disease (22). Obesity, especially abdominal is a risk factor for cardiovascular disease and type 2 diabetes mellitus. Obese patients have glucose intolerance and insulin resistance more than thin or normal weight people. Patients with visceral obesity usually have disruption of plasma lipids and more risk of cardiovascular disease (23).

Other factors that increase the risk of cardiovascular diseases are aging and gender (male with a greater increase). Age of mortality of cardiovascular disease has decreased in the past few decades, so that the age of death in the United States in 2006 compared to 1950 for coronary artery disease, 69% and for ischemic heart disease, 76% decreased (24). There is a misconception that cardiovascular diseases often occur in men. Although before 60 decades the prevalence of cardiovascular disease is higher in men, after the 60s and 70s the prevalence of this disease is equal in both genders (25).

Inflammation implicated in atherosclerosis and acute coronary syndromes and atherosclerosis is an inflammatory disease. White blood cells play an important role in the onset and progression of atherosclerosis (26). Also, along with risk factors the average of white blood cells increases significantly (27).

According to items listed above and due to different cultures, social environments and living conditions, the prevalence of risk factors for coronary artery disease have been different. Identifying the risk factors of this disease has great importance to health programming. Furthermore, any plan for the prevention of coronary artery disease requires sufficient information about its epidemiology and identification associated of high risk groups and factors. So, the aim of this study is to find the relationship between risk factors for coronary artery disease with the number of coronary artery stenosis in angiography for proper planning based on the results to reduce causes comes into action.

## Material and methods

This cross- sectional study was carried out for eight months in ShahidMadani heart hospital as convenience sampling. The study population included 300 patients with coronary artery disease which was confirmed by coronary angiography and were hospitalized in ShahidMadani heart hospital. Data was collected by questionnaire including age, sex, weight, height and body mass index, diabetes mellitus, hypertension, family history of heart disease, smoking, drug addiction, occupation, place of residence and education. Number of stenotic arteries was revealed by angiography. Data were analyzed by Chi-square test, T test and ANOVA with software 17SPSS. P value equal to or less than 0.05 was considered statistically significant.

## Results

Of the total 300 patients included in this study, 213 patients were male (71%) and 87 patients were female (29%). The mean age of participants were 63.3±11.2 years (Min = 25 years and Max = 84 years). The mean age of women was significantly higher than the mean age of men (P= 0.04). 42 patients (14%) had a positive family history of ischemic heart disease. Mean left ventricle Ejection Fraction of patients were 47.6 ± 8.9.

Out of, 300 patients, 87 admitted with ST elevation myocardial infarction, 35 patients with Non ST elevation MI, 124 patients with unstable Angina, 49 patients with chronic stable Angina and 5 patients due to positive exercise test or heart scan underwent coronary angiography (Figure 1).

In our study, 57.3% of patients had a history of hypertension, 33.3% had a history of smoking, 1.7% had a history of opiate drug addiction, 0.7% had a history of alcohol and 1% had a history of smoking shisha. The average body mass index (BMI) of the

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patients were 27.7±4.9 (Min=16.4 and Max=54.9)). Incidence of three, two and one vessel involvement did not differ among women and men (P=0.07). Most coronary artery involvement related to three vessels disease by 38% and 14 patients (4.67%) had involvement of left main coronary lesion. The age of patients with the number of coronary artery involvement had direct and significant correlation (P=0.02).

After examining the relationship of the past medical history with the number of stenotic coronary arteries, we conclude that just in patients with a history of ischemic heart disease there were significant differences among the groups with one, two and three vessel involvement (P< 0.001)(Table 1). There were no significant correlations among the other past medical history with the number of stenotic coronary arteries. Left ventricular ejection fraction had direct and significant correlations with number of involved coronary arteries. (Table 2).

Table 1: **Qualitative data of patients based on the number of 1 Vessel involved**

| Variables | Categories | 1 Vessel involved | 2 Vessel involved | 3 Vessel involved | P- Value |
|---|---|---|---|---|---|
| **Gender** | Male | 65 (30.5%) | 75 (35.2%) | 73 (34.3%) | 0.07 |
| | Female | 25 (28.7%) | 21 (24.1%) | 41 (47.1%) | |
| **Education** | Illiterate | 35 (32.7%) | 29 (27.1%) | 43 (40.2%) | |
| | Undergraduate | 39 (29.3%) | 43 (32.3%) | 51 (38.3%) | |
| | Diploma | 8 (20.5%) | 19 (48.7%) | 12 (30.8%) | 0.18 |
| | Bachelor | 4 (66.7%) | 1 (16.7%) | 1 (16.7%) | |
| | Higher education | 1 (50%) | 1 (50%) | 0 (0%) | |
| **Resident** | Urban | 70 (29.5%) | 77 (32.5%) | 90 (38%) | 0.92 |
| | Rural | 20 (31.7%) | 19 (30.2%) | 24 (38.1%) | |
| **Blood pressure** | Yes | 43 (25%) | 59 (34.3%) | 70 (40.7%) | 0.09 |
| **Diabetes mellitus** | Yes | 20 (22.2%) | 29 (32.2%) | 41 (45.6%) | 0.15 |
| **Hyperlipidemia** | Yes | 26 (31.3%) | 29 (34.9%) | 28 (33.7%) | 0.69 |
| | | | 67 (30.9%) | 86 (39.6%) | |
| **Ischemic heart disease** | Yes | 10 (14.3%) | 25 (35.7%) | 35 (50%) | |
| **Positive family history** | Yes | 13 (31%) | 13 (31%) | 16 (38.1%) | 0.98 |
| **Smoking** | Yes | 27 (27%) | 36 (36%) | 37 (37%) | 0.53 |

Table 2: **Quantitative of patients based on the number of Vessel involved**

| Variables | 1 Vessel Disease | 2 Vessel Disease | 3 Vessel Disease | P- Value |
|---|---|---|---|---|
| **BMI** | 27.85 ± 5.04 | 27.96 ± 5.35 | 27.44 ± 4.64 | 0.72 |
| **EF (%)** | 49.11 ± 9.46 | 48.02 ± 7.04 | 45.95 ±9.39 | 0.03* |
| **Age** | 58.85 ± 12.73 | 65.65 ± 12.12 | 63.29 ± 10.11 | 0.02* |

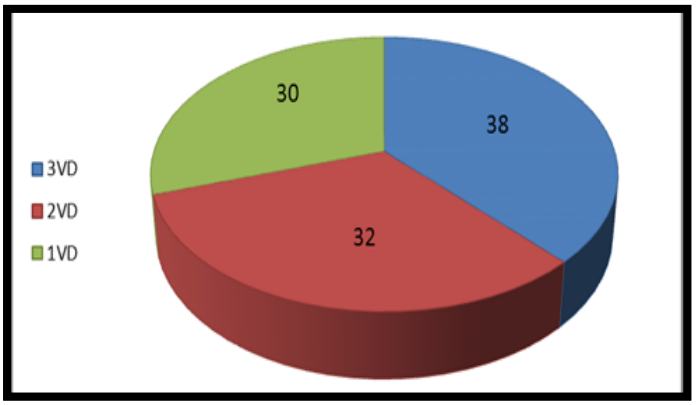


**Figure 1.** Frequency of the number of Vessel involved. 1VD: 1 Vessel Disease; 2VD: 2 Vessels Disease; 3VD: 3 Vessels. Disease Data are represented as % of involvement.

## Discussion

This study showed that age has a direct impact on the number of involved coronary arteries confirmed by coronary angiography and by increasing age, number of involved coronary arteries increase too. Several previous studies described the relationship between cardiovascular risk factors with severity of coronary artery involvement and shown that patient with abnormal angiography had a higher mean age than people with normal angiography (28). Studies have also showed that, by increasing age, coronary artery involvement increases too (29-32).

Our study also showed that gender had no effect on the number of involved coronary arteries. The impact of gender on the number of coronary arteries involved has been different and some studies have reported similar results (30). But in some studies the number of coronary arteries involved in women was higher than men (33). While the results of some studies have reported that the number of coronary arteries involved in men was higher than women (29, 34), in our study, ineffectiveness of gender in the number of coronary arteries involved may be due to older women in the study group compared to men.

In our study, BMI was not associated with the number of involved vessels. Similar results were obtained in other studies too (37). In several studies, the average body mass index with the number of vessels involvement has been shown significant difference (20, 35,36). In our study, due to no difference between the sets of data, there may be higher prevalence of obesity in the younger population than in previous decades and so neutralizes the effect of it through the impact of age on the number of involved vessels.

Also, there was not a statistically significant relationship between hypertension and the number of involved vessels. In previous studies, it has been shown that hypertension associated with a greater coronary artery disease (38, 39). Despite of proved relation among hypertension, atherosclerosis and coronary artery disease, other studies have not shown relationship between hypertension and number of involved vessels (40).

In this study, smoking and drugs addiction and alcohol use were not significantly associated with the number of occluded coronary arteries. In spite of relevance of cigarette smoking, drug addiction and alcohol use with atherosclerosis, some other studies have not shown the relationship between these factors and the number of involved vessels (1, 29, 31 and 40). Due to the increase in Cigarette use in youth and starting at a younger age, it can be adjusted with age factor. Disaffiliation of the number of involved vessels with alcohol also may be due to the small number of patients taking alcohol. It has been shown that drug addiction more than two years can be a risk of coronary artery stenosis (41).

Moreover, there was no significant association between diabetes mellitus and number of involved coronary artery (according to the classification in one, two and three vessel), but there was a possible significant difference if it was analyzed based on one vessel and more than one vessel. In other studies it has been shown that diabetics are more prone to multi vessel coronary disease (42).

There was not significant correlation between history of diagnosed hyperlipidemia before admission and the number of affected coronary arteries. However, similar results were obtained in some studies (29). However, other studies have shown that increase of low-density lipoprotein is a risk factor of severity and number of coronary arteries involvement (43). In our study cause of no relationship between hyperlipidemia and number of involved coronary artery may be use of history of hyperlipidemia based on presence or absence of diagnosed disease before admission but other studies asses' relationship between serum Low-density lipoprotein and cholesterol level and severity of coronary artery involvement.

Left ventricular ejection fraction was different in the three groups and had a significant relationship with the number of stenotic coronary arteries (P=0.03). Previous studies showed there was significant relationship between Left ventricular ejection fraction and the number of involved coronary arteries (29). In our study, there was no significant relationship among their level of education, place of residence and occupation with the number of stenotic coronary arteries. A study has shown similar results (35). In contrast, a different study showed significant association between these factors and the number of affected coronary arteries (29).

## Conclusion

In this study, age had a direct relation with number of coronary artery stenosis in angiography (P=0.02). There was no significant difference between men and women in the number of involved vessels (P=0.07). Other known risk factors of atherosclerosis had no statistically significant correlation with the number of coronary arteries stenosis. There was a significant relation between the left ventricular ejection fractions of patients with number of involved coronary artery.

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# Analysis of adult intoxication cases treated in ICU: A sample from Adıyaman Region of Turkey

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## Abstract

**Objective:** We determined the patient profile and aim to look into the distribution of age and sex, intoxication route, the duration of the stay in ICU and prognosis of the cases we accepted to our ICU presenting with intoxication.

**Material and Methods:** Before the research, approval was granted by the Ethical Committee. 259 intoxication patients, accepted and treated in the ICU of Adıyaman University Hospital between the dates of 2012-2014, were included in the research.

**Results:** Total of 259 as 83 male, 176 female patients were examined. 75.7% of the cases were below age of 30. 92% of the cases received in ICU were suicidal and 8% of them were accidental intoxication cases. When the causes were observed, 85.7% of the cases were intoxicated by drug intake. Most frequently used drugs were antidepressants (43.6%). The mean number of the days in intensive care unit was 2.02 days.

**Conclusion:** As a result, most of the intoxication cases in intensive care unit were made up by young age cases who received antidepressants with suicidal intentions. Acute drug intoxications have better response to intensive care treatments and shorter duration of stays while non-pharmacological intoxications have longer duration of stays.

**Key words:** Adıyaman Region, adult cases, Intensive Care Unit, acute poisoning, suicide

## Introduction

Intoxication is the occasion of unwanted signs or symptoms in the organism caused by a toxic substance or a non-toxic substance received at a toxic dose (1). Intoxications can emerge as intake of drug or substance with an aim of suicide, unintentional usage of overdose medication or uncalled drug reactions (2,3). Intoxication cases constitute about 5-14% of the patients in intensive care unit (4). In Turkey, it is stated that the percentage of the intoxication cases in all the cases rushed to the emergency service is 0.91% and the percentage of intoxication cases is 5.11% in all the cases treated in intensive care unit (3).

Besides emergency treatment, in intoxication cases, preventing absorption of toxic substance by the gastrointestinal system, accelerating the excretion, giving specific antidote, offering supportive care, emergent dialysis under certain conditions can be applied among the main treatment principles (5).

We aim to look into the distribution of age and sex, the way of intoxication and its type, the duration of the stay in intensive care and prognosis of the cases we accepted to our intensive care unit presenting with intoxication.

## Material and Methods

Before the research, approval was granted by the Ethical Committee of Adıyaman University Training and Research Hospital non-invasive Clinical Research (28/04/2015-0316). 259 patients, treated for the reason of intoxication in the intensive care unit of Adıyaman University Training and Research Hospital between the dates of 2012-2014, were included in the research. Demographical data and clinical features of the cases were determined by scanning file records.

The cases were evaluated under the titles of demographical data, intoxication type (Suicide, accident), agents exposed, duration of intensive care, drug intake, and discharge type from the intensive care unit and mortality.

**Statistic:** The collected data were installed and evaluated by computer program SPSS 15.0 (Statistical Package for Social Science).

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The descriptive statistics for the continuous variable in the research were stated as: mean, standard deviation, minimum and maximum values, and categorical variables were stated as numbers and percentage. For the comparison of two independent group, Independent T-Test was used and $p<0.05$ value was statistically found meaningful.

## Results

259 patients, followed and treated for the reason of intoxication in the intensive care unit of Adıyaman University Training and Research Hospital between the dates of January 2012- December 2014, were observed. 83 (32%) of the cases were male and 176 (68%) of them were female. The mean age of the cases was 25.72. The youngest age was 15 and the oldest age was determined as 81 (Table 1).

The cases were studied in five categories according to the age groups, which were: 15-20, 21-30, 31-40, 41-50 and above. In intoxication, when looked into all age groups, it was determined that females were 68% and males were 32% ($p<0.05$). 75.7% (n: 196) of the cases were below the age of 30. Considering the intoxication taking place under the age of 30 the percentage of the females was meaningfully higher than the males ($p<0.05$). Furthermore, the intoxications cases after the age of 50 the rates of the males were found as 57% (Table 2).

92% of the cases received in ICU were suicidal and 8% of them were accidental intoxication cases ($p<0.05$). The rate of suicidal intoxication cases were identified 94% for females and 87% for males ($p>0.05$) (Table 2).

When the causes of intoxication cases were observed, it was seen that 85.7% (n: 222) of the cases were intoxicated by drug intake and 14.3% (n: 37) of them were intoxicated by non-pharmacological reasons. 74.8% of drug intake cases were single drug intake while 25.2% were multiple drug intakes. The mean number of the days in intensive care unit was 2.02. Duration of the stay in ICU was determined as 1.84 days for single drug intake cases, 1.91 days for multiple drug intake cases and 3.0 days for the cases of non-pharmacological intoxications ($p<0.05$). The longest duration of stay in ICU occurred in alcohol, pesticides and organophosphate intoxications (Table 3) (Figure 1).

In the cases intoxicated by drug intake, it was seen that the most frequently used drugs were antidepressants (43.6%), the second most frequently used drugs were analgesic anti-inflammatory drugs (17%). In non-pharmacological intoxications organophosphates (7%) were stated to be the most frequent cause (Table 4).

In our research, mortality was defined as 0.38%. While 63.7% of the cases were discharged, 34.7% of them were transferred to the service (Table 5).

**Table 1:** The data regarding the demographical features and the number of the days in intensive care unit.

| Sex | N | Age (year) (Mean±SD) | Number of the days In ICU (day) |
|---|---|---|---|
| **Male** | 83 (32%) | 28.67±12.98 | 2.41±2.47 |
| **Female** | 176 (68%) | 24.23±9.12 | 1.84±0.99 |
| **Total** | **259** | **25.72±10.78** | **2.02±0.63** |
| p | | 0.01 | 0.008 |

SD: Standart deviation ICU: Intensive Care Unit

**Table 2:** The distribution of age groups by the sex

| Intoxication Type | N | F/M | Male | F/M (%) |
|---|---|---|---|---|
| **Suicide** | 238 (92%) | 166 (94%)* | 72 (87%) | 70/30 |
| **Accident** | 21 (8%) | 10 (6%) | 11 (13%) | 48/52 |
| Age Groups (year) | | | | |
| **15-20** | 110 (42.5%) | 79 | 31* | 72/28 |
| **21-30** | 86 (33.2%) | 62 | 24* | 72/28 |
| **31-40** | 37 (14.3%) | 21 | 16 | 57/43 |
| **41-50** | 19 (7.3%) | 10 | 9 | 53/47 |
| **50+** | 7 (2.7%) | 3 | 4 | 43/57 |
| Total | 259 (100%) | 176 | 83 | 68/32 |

(*) shows the values lower than $p<0.05$.

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**Table 3**: The causes of intoxications and the number of the days in ICU

| The causes of intoxications | Number (%) | Duration of stay in ICU (day) |
|---|---|---|
| **Single Drug** | 166 (64%) | 1.84 |
| **Multiple Drug** | 56 (22%) | 1.91 |
| **Non-Pharmacological** | 37 (14%) | 3.0 |
| **Total** | **259 (100%)** | **2.02** |
| p | 0.001 | |

**Table 4**: The chart of the intoxications reasons

| | Drug Name | Number | Percent (%) |
|---|---|---|---|
| **Drug** | Antidepressant | 113 | 43.6 |
| | Analgesic-anti-inflammatory | 44 | 17 |
| | Antihypertensive | 9 | 3.7 |
| | Antibiotics | 8 | 3 |
| | Other Drugs | 23 | 8.8 |
| | Unknown | 25 | 9.6 |
| | **Total** | **222** | **85.7%** |
| **Non-pharmacological Causes** | Organophosphates | 18 | 6.9 |
| | Alcohol | 3 | 1.2 |
| | Bleach | 3 | 1.2 |
| | Pesticides | 6 | 2.3 |
| | Fungi | 3 | 1.2 |
| | Other | 4 | 1.5 |
| | **Total** | **37** | **14.3%** |

**Table 5**: The data regarding the relation of intoxication causes and sex with prognosis

| | N | Discharged | Transfer to Service | Death | Transfer to an Advanced Centre |
|---|---|---|---|---|---|
| **Male** | 83 | 49 (59%) | 32 (38.6%) | 1 (1.2%) | 1 (1.2%) |
| **Female** | 176 | 116 (65.9%) | 58 (33%) | - | 2 (1.1%) |
| **Suicide** | 238 | 151 (63.4%) | 84 (35.3%) | 1 (0.4%) | 2 (0.8%) |
| **Accident** | 21 | 14 (66.7%) | 6 (28.6%) | | 1 (4.8%) |
| **Total** | **259** | **165 (63.7%)** | **90 (34.7%)** | **1 (0.4%)** | **3 (1.2%)** |
| p | | | >0,05 | | |

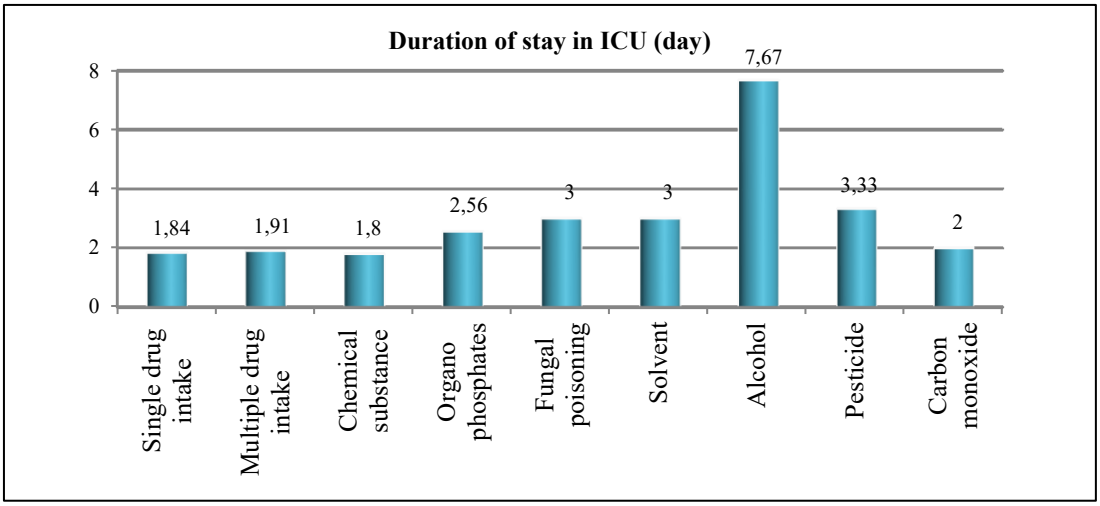


**Figure 1**: The graphic of the relation between the cause of intoxication and the duration of stay in ICU.

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## Discussion

Intoxication is defining a chemical substance's potential of harming the body. In our age the rate of the intoxication cases around the world is increasing day by day due to the changing life style and social behaviours. 5-30% of intensive care unit beds are occupied by intoxication cases (5,6). In acute intoxication cases by evaluating the patient's clinic and laboratory symptoms, and the causes of intoxication, the cases with life threatening situations are accepted to the ICU, followed and treated.

The cause of intoxication varies according to the geographic conditions, age, sex, education level, traditions of the region and seasons (7). Research studies state that intoxication cases are more common among young female population.

A study in Turkey (8), it was reported that 0.64% of the patients presented in emergency service were acute intoxication cases. It was also identified that the mean age of all the cases was 28.16±11.74, and 68.6% of them were female. 84.9% of these intoxications were suicidal and 15.1% of them were accidental exposure. In our study, 68% of the cases were female and 32% of them were male. The mean age of all the cases was 25.72±10.78.

75.7% of the cases were the patients under the age of 30 in our study. It was notified that the rate of the female intoxications was meaningfully higher in comparison with the males regarding the intoxications under the age of 30 while the rates were similar concerning the intoxications above the age of 30.

In our study 92% of the intoxication cases received at ICU, were for suicidal reasons and 8% of them were accidental exposure. In the study held by Demirel et al. (9) female/male rate in 457 acute intoxication cases, treated in intensive care unit, was found 2.46. 92.2% of these intoxications were because of suicidal reasons and 7.8% of them were accidental exposure cases, and similar results were gathered in our research. Abdollahi et al. (2) reported that accidental exposure in children and suicidal intoxication in women was more common. We consider that the high rates of female suicidal intoxications under the age of 30 are due to the fact that they are more emotional.

Technological and socio-economic improvements make drug and chemical substance access much easier (10). According to the information provided by Ministry of Health in Turkey, the most frequent acute intoxication factors are respectively, drugs (analgesic, antidepressant, antihistaminic etc.), agricultural pesticide and insecticide (organophosphates etc.), domestic chemicals (bleach, detergents etc.), toxic gases (carbon monoxide, choking gases), other chemicals, plants and nutrition (fungi, saloon plants, fish, andromedotoxine, apricot seed, etc.) and venomous animal bites and stings (scorpion, snake, spider, bee etc.) (11).

Demirel et al. (9) as drugs are defined as the most frequent cause of intoxications; it was stated that 28.6 of the cases received more than one drug and the drugs taken by 6.56% of the cases were unidentified. It is stated that antidepressants (23.8%) are known as the most common cause of intoxications and they are followed by analgesic-anti-inflammatory (18.1%) and antihistaminic (7%) in intoxication cases. Mortality rate in the research was calculated as 0.21%. In the research of Ayan et al. (12) the rate of intoxications was found as: 47% drug, 22% carbon monoxide and 8.3% agricultural pesticide. When literature is reviewed it comes out that the most important cause of intoxications are drugs (5,13). In our research it was also seen that 222 (85.7%) of the cases were intoxicated by single or multiple drug intake and 37 (14.3%) of the cases were intoxicated by exposition to non-pharmacological factors. In 9.6% of drug intake cases, the drugs received were unidentified. Besides, Ergun et al. (8) reported that out of 1380 acute drug intoxication 48.1% of them occurred by psychoactive drugs (n:664), and 33.5% of them were analgesic (n: 463). Mortality rate in the research was calculated as 0.58%. Considering the most common reason of intoxications is suicidal, we think that easy access to drugs allows abusing and for this reason it becomes the most frequent factor for intoxications.

The patients having depression treatment have higher suicide attempt and it is determined that these patients attempt to commit suicide with their own medication. The research upon this matter indicated that 50% of the cases attempting suicide were the patients with earlier history of psychiatric problems (14,15). In our study the rate of intoxication with an antidepressant is 43.6%. The second frequent cause becomes analgesic-anti-inflammatory (17%) drugs. The most common non-pharmacological intoxication is due to organophosphates (6.9%).

In our study the mean duration of stay in ICU was 2.02 days. The length of stay in intensive care unit was found 3.5 days by Kurt et al. (16) and by Yagan et al. (1) the duration was found 3.77 days and by Ersoy et al. (17) the duration was found 3 days. The duration of stay was calculated lower compared to the literature. Besides, it was determined that for single drug intake cases mean duration of stay was 1.84 days, for multiple drug intake cases the mean was 1.91 days and for non-pharmacological intoxication cases mean stay was 3 days. In acute drug intoxications, early diagnosed good treatment response is seen with symptomatic treatments like stomach lavage that decrease absorption and increase excretion, and there are opportunities of specific antidotes.

For this reason the duration of stay in our research was short. In non-pharmacological intoxication cases the mean length of stay in intensive care was found meaningfully longer. And the longest stay in ICU was in alcohol intoxications.

It was notified in the studies that mortality rate in intoxications varied between %0.03-27 (18,19). Mortality rate of our research was found as 0.38%. The only case progressing mortal was acute alcohol intoxication. We related the reason of low mortality rate to the high rate of drug intoxication and new antidepressants being less toxic.

## Conclusion

As a result, most of the intoxication cases in intensive care unit were made up by young age female cases who received antidepressants with suicidal intentions. Acute drug intoxications have better response to intensive care treatments and shorter duration of stays while non-pharmacological intoxications have longer duration of stays. By the reason of easy access to drugs, we consider that they are open to abuse and some precautions are needed to be taken.

**Conflict of Interest:** The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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# The effects of glycemic control on malondialdehyde modified low-density-lipoprotein-immunglobulin G levels in type 2 diabetics

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## Abstract

**Objective:** The objective of this study was to investigate the effects of glycemic control on the levels of malondialdehyde-low-density-lipoprotein-immunglobulin G (MDA-LDL-IgG) which is supposed to be positively correlated with myocardial infarction risk in subjects with type 2 diabetes mellitus (DM).

**Material and Method:** Glucose, triglyceride, total cholesterol, high-density-lipoprotein-cholesterol (HDL-C), low-density-lipoprotein-cholesterol(LDL-C), hemoglobin A1c (A1C) and MDA-LDL-IgG levels were evaluated in subjects with well-controlled DM (W-DM, <7% HbA1c, n=18), poorly-controlled DM (P-DM, >7% HbA1c, n=22) as well as in non-diabetics (Non-DM, n=15).

**Results:** There were no significant differences between P-DM and W-DM groups in terms of triglyceride, total cholesterol and LDL-C levels, however the test results were significantly low for the Non-DM group in comparison with other groups (respectively, p=0.002, p<0.001 and p=0.001). There was no significant difference between W-DM and Non-DM groups with regard to MDA-LDL-IgG levels, however they were significantly higher in P-DM group compared to W-DM and Non-DM (p=0.002). There was a positive correlation between A1C and MDA-LDL-IgG levels (r=0.463, p=p=0.001).

**Conclusion:** These findings suggest that the normalization of blood glucose levels in type 2 diabetics may persuade the reduced rate of formation of new antigenic epitopes on the LDL via non-enzymatic glycosylation. The regulation of diabetes may be improved by reducing antibody formation against the MDA-LDL although there is no effect on lipid levels. A1C may not only be a good indicator of blood glucose control but also a good predictor for diabetes-related macro vascular complications

**Key words:** Type 2 diabetes mellitus, A1C, glycemic control, Cholesterol, MDA, LDL

## Introduction

Diabetes mellitus (DM) is a complex disease associated with obesity, autoimmunity and inflammatory disorders (1–3). Type-2 DM is the most common type of DM worldwide and its incidence is increasing in Western societies (4). Severe complications may occur as a result of all these factors related with DM. Most common complications can be classified as macro-vascular (myocardial infarction, stroke, and peripheral arterial disease) and microvascular (retinopathy, nephropathy, neuropathy) (5,6).

Lipid abnormalities are common in patients with Type 2-DM and are generally characterized by decreased serum levels of high density lipoprotein cholesterol (HDL-C), increased triglycerides (TG), total cholesterol (TC) and low density lipoprotein (LDL-C) particles (1). Atherosclerosis is an inflammatory disease which is strictly related with serum lipid abnormalities and diabetics are predisposed to atherosclerosis process in earlier stages of their lives (3).

Cellular uptake of cholesterol takes place via clathrin mediated low-density-lipoprotein (LDL) receptors and these receptors regulate themselves with feedback mechanisms (7,8). However, macrophage cells phagocyte the modified LDL molecules in the pathogenesis of atherosclerosis by endocytosis via scavenger receptors which are distinct from classical LDL receptors.

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The accumulation of modified LDL in macrophages and other phagocytes leads to the formation of foam cells (9). Due to exposure to different molecular modifications, LDL is a critical molecule which plays an important role in development of atherosclerosis. Advanced glycosylation and oxidation of LDL are both well-known modifications for pathogenesis of atherosclerosis leading to formation of neo-antigenic epitopes on the LDL thus transforming it into a highly immunogenic molecule (10–12). Modified LDL induces the innate and adaptive immune cells, as a result, stimulating the formation of the foam cell and auto-antibodies against LDL(13,14).

MDA-LDL is an oxidatively modified LDL molecule and plays an important role in the progression of atherosclerosis. Macrophage cells transform into foam cells by the over-uptake of MDA-LDLs via scavenger receptors while in addition , humoral immune response develops against neoepitopes resulting from lipoprotein modification (9,11). The immune complexes of oxidized-LDL and IgG have been demonstrated to be more potent activators of macrophages in comparison with just oxLDL(26). MDA-LDL-IgG is an autoantibody against MDA-LDL and previous studies have shown that immune complexes of MDA-LDL and IgG are strong predictors for acute events such as myocardial infarction and stroke in patients with type 2-DM (23).

The formation of immune complexes of immunoglobulin G (IgG) and malondialdehyde modified LDL (MDA-LDL) increases the pro-inflammatory immune response and leads to progression of atheroma plaque (19,20,21). Clinical studies on type1-DM have shown that high levels of MDA-LDL and Ig complexes are associated with increased odds for developing diabetic nephropathy and progression of retinopathy (22). Furthermore, it is reported that increased levels of MDA-LDL immune complexes are strong predictors of myocardial infarction in patients with type2-DM (23).

Currently, studies usually focus on the effects of MDA-LDL in the pathogenesis of diabetic complications. Most of these studies suggest a strong correlation between MDA-LDL/Ig complexes and the diabetic complications. Based on these studies, we tried to investigate whether there is a relationship or not between diabetes regulation and serum levels of MDA-LDL-IgG in subjects with type 2-DM. In this study, we evaluated the levels of glucose, TG, TC, HDL-C, LDL-C and MDA-LDL-IgG in subjects with well-controlled DM (W-DM, <7% HbA1c), poorly-controlled DM (P-DM, >7% HbA1c) and non-diabetic (Non-DM) subjects.

## Material and Methods

This study was performed at the Istanbul Research and Education Hospital, Medical Biochemistry Laboratory.

The serum samples and demographical data were obtained from our laboratory and laboratory information system (LIS). The groups were created according to ICD-10 (International Statistical Classification of Diseases and Related Health Problems) E11 codes. Serum samples were separated into groups as P-DM (n=22), W-DM (n=18) and Non-DM (n=15) according to inclusion criteria. MDA-LDL-IgG ELISA analyses were performed on waste serum samples.

A1C levels were evaluated using Synchron LX-20 (Beckman-Coulter) auto-analyzer in the complete blood count samples drawn into vacutainer 2 mL volume tubes containing 3.6 mg K2 EDTA. The serum glucose, TG, TC, HDL-C and LDL-C (direct method) levels were evaluated via Synchron LX-20 (Beckman-Coulter) auto-analyzer in the serum samples drawn into vacutainer 10mL volume SST™ tubes with Silica Clot Activator (Becton Dickison). Finally, serum MDA-LDL-IgG levels were evaluated via the ELISA method according to manufacturer instructions (LDN, Labor Diagnostika Nord GmbH & Co. KG).

Descriptive statistics for the studied variables (characteristics) were presented as median, mean, standard deviation, minimum and maximum values (Table 1). One-way ANOVA test was performed to compare all groups. The Bonferroni method was used for homogeneous variances and the Tamhane's T2 method was used for nonhomogeneous variances. The correlation analysis of parameters was performed using nonparametric Spearman's rho correlation method. Statistical significance level was considered as 5% and SPSS (ver: 20) statistical program was used for all statistical computations.

## Results

All groups of glucose, TG, TC, HDL-C, LDL-C, HbA1c and MDA-LDL-IgG levels were summarized in Table-1. There were no significant differences between P-DM and W-DM groups for TG, TC and LDL-C levels, howeverthese tests were significantly low in Non-DM group in comparison with other groups (respectively, $p=0.002$, $p<0.001$ and $p=0.001$). No statistically significant difference was observed between groups in terms of HDL-C ($p=0.081$). There were significant differences between the three groups in terms of glucose ($p<0.001$) and A1C ($p<0.001$) levels.

There was no significant difference between W-DM and Non-DM groups in terms of MDA-LDL-IgG levels, however they were significantly higher for the P-DM group in comparison with W-DM and Non-DM ($p=0.002$). There was a strong positive correlation (Correlation Coefficient=0.463) between A1C and MDA-LDL-IgG levels ($p=0.001$). The comparison chart of all parameters is shown in Figure 1.

**Table 1:** Evaluation of all parameters and comparison between the groups of poorly controlled DM (P-DM, n=22), well controlled DM (W-DM, n=18), and non-diabetic subjects (Non-DM, n=15).

| Parameters | Group | Median | Mean | SD | Min | Max | p |
|---|---|---|---|---|---|---|---|
| **Glucose (mg/dL)** | P-DM | 181,50 **a** | 215,31 | 97,37 | 93 | 551 | <0,001 |
| | W-DM | 135,50 **b** | 155,27 | 37,36 | 100 | 233 | |
| | Non-DM | 93,00 **c** | 94,26 | 6,56 | 79 | 110 | |
| **Triglyceride (mg/dL)** | P-DM | 185,00 **a** | 198,63 | 80,40 | 110 | 465 | 0,002 |
| | W-DM | 209,90 **a** | 221,66 | 135,25 | 60 | 595 | |
| | Non-DM | 75,00 **b** | 100,33 | 57,39 | 45 | 210 | |
| **Total Cholesterol (mg/dL)** | P-DM | 247,00 **a** | 236,54 | 37,81 | 156 | 313 | <0,001 |
| | W-DM | 225,50 **a** | 227,77 | 29,23 | 161 | 300 | |
| | Non-DM | 176,00 **b** | 174,93 | 12,47 | 152 | 196 | |
| **HDL-C (mg/dL)** | P-DM | 54,00 **a** | 55,09 | 12,25 | 37 | 89 | 0,081 |
| | W-DM | 48,00 **a** | 48,61 | 7,26 | 38 | 67 | |
| | Non-DM | 55,00 **a** | 54,53 | 6,71 | 41 | 68 | |
| **LDL-C (mg/dL)** | P-DM | 146,50 **a** | 141,72 | 39,49 | 62 | 222 | 0,001 |
| | W-DM | 134,00 **a** | 134,83 | 29,05 | 84 | 196 | |
| | Non-DM | 108,00 **b** | 100,33 | 19,21 | 71 | 134 | |
| **A1C (%)** | P-DM | 9,80 **a** | 10,26 | 1,73 | 8,6 | 14,8 | <0,001 |
| | W-DM | 6,80 **b** | 6,60 | 0,67 | 5,3 | 7,9 | |
| | Non-DM | 5,00 **c** | 4,95 | 0,26 | 4,5 | 5,5 | |
| **MDA-LDL-IgG (U/L)** | P-DM | 358,35 **a** | 504,27 | 260,67 | 267,30 | 1102,20 | 0,002 |
| | W-DM | 320,60 **b** | 342,15 | 115,58 | 204,80 | 619,60 | |
| | Non-DM | 332,70 **b** | 298,91 | 63,85 | 188,90 | 605,20 | |

It is a statistically significant difference between the groups with different letters; a, b and c ($p<0.05$) Min:Minumum; Max:Maximum; SD: standard deviation

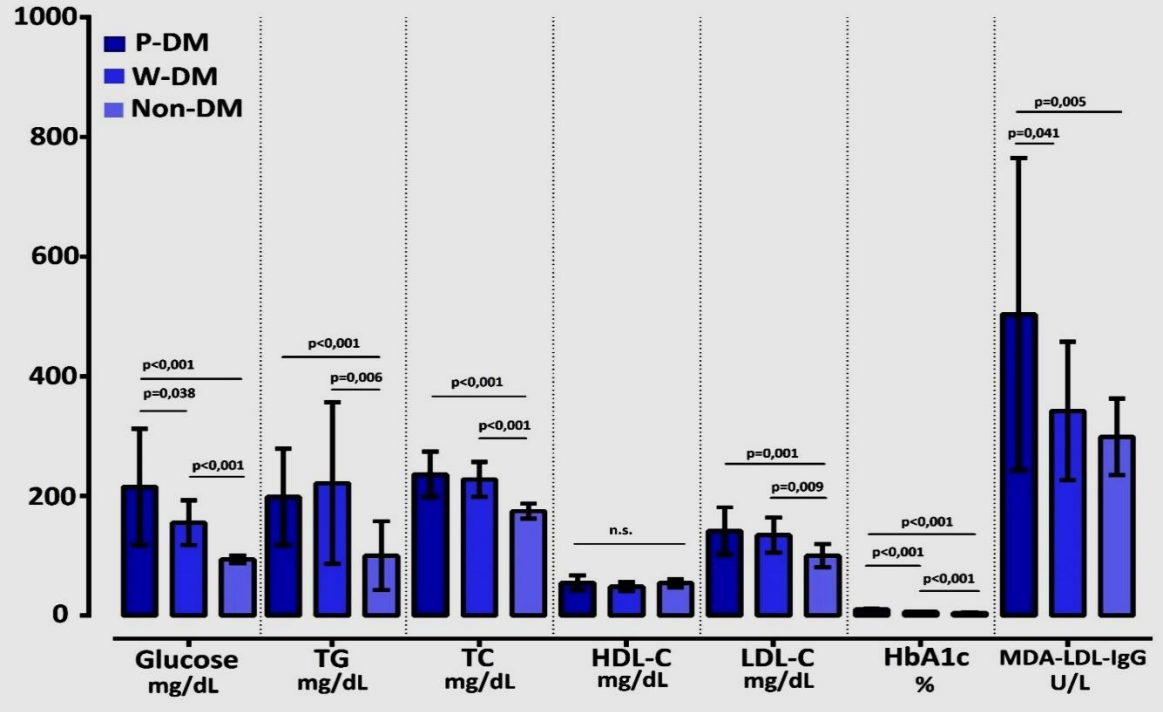


**Figure 1:** The comparison chart of the levels of all parameters. Data are presented as mean±SD (standard deviation). P-DM: poorly controlled diabetes mellitus, W-DM: well controlled diabetes mellitus, Non-DM: non-diabetic subjects, TG: Triglyceride, TC: Total cholesterol, HDL-C: High density lipoprotein cholesterol, LDL-C: Low density lipoprotein cholesterol, MDA-LDL-IgG: Malondialdehyde modified low density lipoprotein IgG

## Discussion

In this study, we observed that the regulation of DM did not affect serum lipid levels. There was no significant difference between P-DM and W-DM subjects for TG, TC, HDL-C and LDL-C, but serum lipid levels of both groups were significantly higher in comparison with the Non-DM group. Subjects of the P-DM group have the highest level of MDA-LDL-IgG but there was no significant difference between the W-DM and Non-DM groups.

Glycosylation is the reaction by which a carbohydrate is covalently attached to a target protein. Glycosylation is a mandatory process to produce functional proteins and is usually performed with the assistance of an enzyme (24). However, there is also another non-enzymatic version of glycosylation. The non-enzymatic glycosylation of proteins is an uncontrolled process and is responsible for the immunogenicity of protein (10). The oxidation of glycosylated proteins plays an important role in initiating lipid oxidation. Furthermore the resultant lipid peroxidation products, which have "neoself determinants" recognized by the immune cells (12,25).

Glycemic control significantly reduces the risk of microvascular complications in diabetic patients. It is considered that a 1% reduction in A1C decreases the risk of retinopathy, neuropathy and nephropathy by about 40% (15,16).

In contrast, there is a limited number of studies on the effect of glycemic control on macro vascular complications of DM, such as myocardial infarction, stroke (17,18).

Persistent high blood glucose is one of the major causes which leads to non-enzymatic glycosylation of proteins. A1C is the well-known form of glycosylated proteins and it is a laboratory test that shows how well your diabetes is being controlled (27). In this study subjects diagnosed with type 2-DM were divided into two groups as W-DM and P-DM according to A1C levels. Although there were significant differences between the levels of glucose and HbA1c, a significant difference was not found between the two groups in terms of serum lipid levels and especially LDL. However, we observed a significant difference between the MDA-LDL-IgG levels for P-DM and W-DM groups in which it is reported as a predictor for macro vascular complications of DM (11,12,14).

There are some limitations in this study. The appearance of diabetes-related complications is related to disease duration. High levels of MDA-LDL-IgG in subjects with P-DM may be associated with the duration of the disease. It is not easy to acquire reliable information about the age of diabetes, because the subjects do not know the beginning of the diabetic process, as a high serum glucose level, for themselves; they are followed later in the duration of diabetes.And even the known duration of diabetes mellitus for each subject was not recorded in the data system. Furthermore, serum samples were obtained from different individuals, therefore we were unable to evaluate the regulation of diabetes and whether there is a direct impact on the reduction of MDA-LDL-IgG levels or not. We also could not reach clinical data related with macro vascular complications.

## Conclusion

We observed a significant difference between P-DM and W-DM groups in terms of their MDA-LDL-IgG levels. Furthermore, it was observed that the levels of MDA-LDL-IgG were similar in subjects with W-DM and Non-DM, and were significantly lower compared to P-DM subjects. These findings suggest that the normalization of blood glucose levels in type 2 diabetics may persuade the reduced rate of formation of new antigenic epitopes on the LDL via non-enzymatic glycosylation. Although there is no effect on lipid levels, the regulation of diabetes may be improved by reducing antibody formation against MDA-LDL.

In addition, there was a positive correlation between A1C and MDA-LDL-IgG levels in type 2 diabetics. A1C may not only be a good indicator of blood glucose control but is also a good predictor for diabetes-related macro vascular complications. Further prospective studies are needed to confirm these findings.

**Conflict of Interest:** The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. The authors are solely responsible for the content and writing of the paper.

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# Relationship between Nurses' Spiritual Well-being and Nurses' perception of competence in providing spiritual care for patients

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## Abstract

**Objective:** As an important factor affecting human's health consequences, spiritual well-being has been the center of attention in recent years. According to literature, nurses' spiritual well-being affects how they provide spiritual care. This paper, thus, aims to find the relationship between nurses' spiritual well-being and their perception of their competence in providing spiritual care for patients in Tabriz Educational-Therapeutic centers

**Material and Methods:** This is cross sectional-analytical research which is conducted on 555 nurses of medical-educational centers in Tabriz in 2014. Data were gathered using three-part questionnaire including demographic information and Spiritual Care Competence Scale (SCCS) and spiritual well-being scale (SWBS). Data analysis was done using descriptive (frequency, percent, mean, standard deviation) and inferential (independent t, Pearson, Spearman, ANOVA Tukey test) statistics using SPSS 21 software.

**Results:** Results showed that nurses' spiritual well-being is significantly and directly associated with their perception of spiritual care delivery ($P<0.05$). Also, Mean score of nurses' perception of their care competence 95.2 (14.4) and Mean score of spiritual well-being 92.4 (12.3) were both above average ($P<0.05$). Type of employment and experience in participating workshops had significant relationship with the nurses' perception of their competence for providing spiritual care and spiritual well-being ($P<0.05$).

**Conclusion:** Research findings indicate that nurses' perception of their spiritual well-being and spiritual care competence were above average. There was also a significant and positive correlation between spiritual health and the nurses' perception of their spiritual care competence

**Key words:** spiritual care, spirituality, spiritual well-being , nurses

## Introduction

Spirituality is a dimension of human existence inducing people a sense of being with qualities such as mettle, a capacity for internal recognition and reinforcement resource, sacred mental experience, individual's ascendency to the love capacity and superior knowledge, integrating with a general shadow of the whole life and finding a meaning for the person's existence (1). The spiritual dimension including biological, mental and social is one of the quadruplet holistic dimensions, which is especially important. Nursing is a holistic field of study according which human being is a multidimensional creature with the spirituality at the center of these dimensions playing a key role in being healthy. Therefore, spiritual care and paying attention to patients' spiritual needs shape an important part of nurses' performance (2).

Spiritual care is a set of used skills in the professional field or nursing process which includes therapeutic relationship between nurse and patient, being accessible for patient, active listening, showing empathy, and hope, providing religious facilities for patients with certain religious beliefs, helping patients and etc (3).

Spiritual care is an important nursing responsibility. American Nurses Association regards spiritual care as of important nursing responsibilities.

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Providing spiritual care for patients is a therapeutic solution having good benefits for patients and the treatment team. At first, it reduces the length of hospital stay among patients. Noticing patients' spiritual problems, identifying their spiritual needs, and giving them a chance to express their spiritual beliefs decrease the use of health resources and consequently their physical and mental problems and raise their satisfaction. Patients are, thus, expected to stay for a shorter time in the hospital (4).

Spiritual well-being produces an integrated and coordinated link between inner forces. It is identified by fixed characteristics of life, peace, the sense of a close connection with self, God, society and the environment. It consists of two dimensions. First, religious well-being is associated with the quality of people's perceptions of health in the spiritual life when in relation with a supreme power. Second, the existential well-being relates to social and mental concerns and how people connect with God, society and self (5). When the spiritual well-being is seriously threatened, individuals may suffer from mental disorders such as feeling of loneliness, depression, and meaninglessness (6). The more nurses become aware of their spiritual condition, they will be more aware of the spiritual state of their patients. This awareness and spirituality in nurses is a prerequisite for creating commitment in the spiritual care process (7). When nurses are completely healthy, they would deliver higher quality care and patients are more satisfied of their professorial services (8).

Studying the connection between nurses' spirituality and spiritual care delivery, Vance indicated that there was a significant positive correlation between nurses' spiritual well-being and the quality of spiritual care (9). According to Walter, spiritual care delivery is not a job all nurses can handle it. It depends on nurses' situation and their spiritual context (10).

In a study on 685 nurses, Ross found out that nurses being aware of their inner spirituality delivered better spiritual cares (11). He relates self-awareness and spiritual care delivery and argues that those nurses seeking their life goal and meaning may provide deeper spiritual cares in spite of identifying limited spiritual needs than those lacking such quality (12). Nurses should be able to completely look after patients. In such all-inclusive investigation, studying the patients' spiritual dimension and considering their spiritual well-being matters more. Therefore, it should be cleared how informed they are of spirituality and spiritual care. Folton recommends that nurses' knowledge and information about spirituality should be expanded up in order to enjoy a better understanding of patients' spirituality and their spiritual needs (13).

The importance of spiritual well-being among nurses and its effect on their perception of spiritual care competence, at the same time lack of literature on this lead us to conduct this research to find an answer for this question: how are nurses' spiritual well-being connected with their perception of their competence in providing spiritual care

## Material and Methods

This is a Cross sectional-analytical research. Study population was all nurses who were nurse or nursing manager in one of the medical-educational centers of Tabriz University of Medical Sciences (head nurse, supervisor, and director of nursing care) and have study criteria (one year work experience and university degree). In order to determine sample size, Morgan table was used (considering 95% and error 5%). Sample consisted of 555 nurses in hospitals related of Tabriz University of medical sciences. Multistage random sampling was used and suitable assignment was used for allocation to wards. Therefore, after selecting hospital, samples were selected randomly considering number of nursing staff in different wards of hospitals. In order to gather data, first, researcher submitted her request from research deputy to related hospitals. Then, researcher referred to selected wards and after explaining the purpose and delivered questionnaires to nurses in there different shifts to complete. Researcher returned one week later to take back questionnaires. Data were entered into SPSS21 and was analyzed.

In order to gather data from demographic questionnaire , Spiritual Care Competence Scale (SCCS) and spiritual well-being questionnaire were used.

Spiritual Care Competence Scale (SCCS) were designed by Van Leeuwen and Cusveller (2009) (14). This scale has 27 questions with 5 point Likert scale (1. Strongly disagree, 2. Disagree, 3. Neutral, 4. Agree, 5. Strongly agree) which is divided to 6 categories individual support and consultation with patient (6 questions 1-6), being professional and improving quality of spiritual care (6 questions, 7-12), attitude toward religious states (4 questions, 13-16), communication (2 questions, 17-18), evaluating and implementing spiritual care (6 questions, 19-24) and referral to experts (3 questions, 25-27).

Questionnaire has minimum 27 score and maximum 135 score such that below 64 is low spiritual competence, 64-98 indicates average spiritual care, and above 98 shows high spiritual competence. In order to obtain perceived mean for each aspect of questionnaire, following procedure was used. Individual support, professionalism, evaluating and implementing spiritual care includes 6 questions in 5-point Likert scale from1 to 5;

therefore, their score range between 6 to 30 with mean 18. Attitude toward religious states has 4 questions ranging 4 to 20 with mean 12. Communication field with score 2 to 10 has mean 6. Referral to expert ranges 3 to 15 with mean 9.

Back translation to Persian was done by two English language experts. Then Persian version was translated again into English. Content validity of Persian version was done by experts' opinion such that the scale was delivered to 10 faculty members of nursing to study questions regarding ease, being clear and relevant. Cronbach alpha was used for reliability of scale and its coefficient was .93. Cronbach alpha was calculated .60 to .89 for each categories. It should be mentioned that said questionnaire as .56 to .82.(14) Reliability and validity was measured by Khalaj et.al in 2013 and Cronbach alpha of questionnaire was .77 and for subscales was .65 to 0.85 (15).

Developed by Palutzian and Ellison in 1982, the spiritual well-being scale (SEBS) includes 20 items. Even questions measure existence well-being and odd questions evaluate regional well-being, and their sum forms the total score of spiritual well-being. Items are measured on the 6-point Likert scale from 1 (strongly disagree) to 6 (strongly agree). Therefore, the score of spiritual well-being range between 20 and 120 and it was investigated in the religious and existential dimensions in the range of 10 to 60. Spiritual well-being was divided into three groups of low (20 to 40), average (41-99), and high (100-120). This questionnaire was employed in various studies inside and outside of the country with reliability and validity confirmed. Palutzian and Ellison validated it and reported the Cronbach's alpha coefficients of religious and existential well-being and the total scale 0.91, 0.91, and 0.93 respectively (16). In their study, Dehshiri et al. estimated the Cronbach's alpha coefficients of religious and existential well-being and the total scale at 0.90, 0.82, and 0.87, and by test-retest at 0.85, 0.78, and 0.81. Here, the same values were calculated by Cronbach's alpha at 0.83, 0.60, and 0.83.

Data analysis was done using SPSS software version 21 and by using descriptive statistics and inferential statistics through t-test, Pearson correlation and Spearman and ANOVA and Tukey test (18).

Before implementing study, proposal was approved by ethics committee of Tabriz University of Medical Sciences. Required information and rights of participants were given to research units and confidentiality of responses was emphasized

## Results

Results indicate that, 88.5 percent of participants were women and 11.5 were men. In terms of education, 91.7 percent held Bachelor's Degree, 4.5 had Master's Degree, and 3.1 percent were with Associates Degree. 429 were married, 118 were single, and 4 were divorced. Regarding the employment conditions, 51.9 percent were contract workers, 34.2 percent were employed on a formal contract, and 13.9 worked in a project. Fewer had participated in morality workshops.

According to findings, the mean score of perception of spiritual care competence (95.2 (14.5)) and spiritual well-being (92.4 (12.3)) were significantly average (see table 1).

Findings showed that the mean score of each items of questionnaire on the perception of spiritual care competence and spiritual well-being were significantly above average (see table 2).

Results disclosed that a significant direct correlation between the mean score of the perception of spiritual care competence and spiritual well-being ($p < 0.05$) (see table 3).

According to findings, the mean scores of the perception of spiritual care competence and spiritual well-being were found to have a significant difference with the type of employment and participating workshops ($p < 0.05$) (see tables 4 and 5). No significant difference was observed in other items (sex, education, working turn, revenue, and position) ($p > 0.05$).

Table 1: one-sample t-test results to obtain the mean score of nurses' perception of their spiritual care competence and spiritual well-being

| Variable | Mean Score | Standard Deviation | Significance Level |
|---|---|---|---|
| **Nurses' perception of their spiritual care competence** | 95.2 | 14.4 | 0.000 |
| **spiritual well-being** | 92.4 | 12.3 | 0.000 |

Table 2: one-sample t-test results to compare means in the areas of studying questionnaire

| Variable | Items | Mean (Standard Deviation) | Average |
|---|---|---|---|
| **Spiritual care competence** | Individually supporting and counseling with patients | 21.1 (4.0) | 18 |
| | Professional and high quality spiritual care | 20.5 (4.3) | 18 |
| | Attitude toward patients' religious spirits | 16.0 (2.5) | 12 |
| | Communication | 7.8 (1.4) | 6 |
| | Evaluating and delivering spiritual care | 20.0 (4.3) | 18 |
| | Visiting specialists | 9.5 (2.3) | 9 |
| **spiritual well-being** | Religious health | 49.6 (7.3) | 35 |
| | Existential health | 42.7 (5.8) | 35 |

Table 3: simple correlation coefficient between the nurses' perception of their spiritual care competence and their spiritual well-being

| Criterion Variable | Statistical Index | Correlation Coefficient (r) | Significance Level |
|---|---|---|---|
| **Nurses' perception of their spiritual care competence** | **Nurses' spiritual well-being** | 0.374 | 0.000 |

Table 4: comparing the total mean-scores for the nurses' perception of their spiritual care competence and their spiritual well-being in Tabriz Educational-Therapeutic centers participating in moral workshops based on independent t-test

| Variable | Participating in Workshop | Number (%) | Mean | Standard Deviation | Statistical test results (p-value) |
|---|---|---|---|---|---|
| **Spiritual care competence** | Yes | 59 (10.6) | 100.8 | 14.9 | 0.002 |
| | No | 496 (89.4) | 94.5 | 14.2 | |
| **spiritual well-being** | Yes | 59 (10.6) | 95.5 | 12.0 | 0.036 |
| | No | 496 (89.4) | 92.0 | 12.2 | |

Table 5: Comparing the total mean-scores for the nurses' perception of their spiritual care competence and their spiritual well-being in Tabriz Educational-Therapeutic centers with employment based on ANOVA test

| Variable | Employment | Number (%) | Mean | Standard Deviation | Statistical Test Results (p-value) |
|---|---|---|---|---|---|
| **Spiritual care competence** | Plan | 77 (13.9) | 90.7 | 16.4 | 0.002 |
| | Contractual | 288 (51.9) | 94.9 | 12.4 | |
| | Formal | 190(34.2) | 97.4 | 14.9 | |
| **spiritual well-being** | Plan | 77 (13.9) | 90.4 | 12.7 | 0.045 |
| | Contractual | 288 (51.9) | 91.8 | 12.6 | |
| | Formal | 190 (34.2) | 94.8 | 11.4 | |

## Discussion

Providing spiritual care for patients are influenced by personal, cultural, and educational factors (23). and those who present these cares should have spiritual and ethical competence. Findings of research show that scores for nurses' spiritual competence care is between (38-135) with mean 95.2 (14.5). which indicates perception of nurses from providing spiritual care for patients is average. Most nurses participated in this research gained average score. In other study, mean spiritual care competence of nurses was 97.5 (13.6) which is consistent with our study (3).

Results showed that the mean scores for each item were significantly above average. The highest and lowest scores respectively related to the attitude toward patients' religious spirits and visiting specialists.

According to findings, the mean score for participating nurses' spiritual well-being was 92.4 (12.3) with the level of spiritual health between 31 and 115. This shows the participants with average spiritual level. Our findings relatively agree with results Akeberi et al. achieved (94.3 (16)) (20). In their study, Farahani et al. also reported an average spiritual level for nursing students (6). The mean scores among participants on religious and existential well-being were reported 49.6 (7.3) and 42.7 (5.8) respectively. This reveals that the mean score of religious health is higher than the existential well-being. This agrees with scores claimed by Fatemi et al. for religious well-being (53.0 (6.1)) and existential well-being (48.3 (5.2)) (20). Such results are not unexpected for our society respecting religious and spiritual values. Regarding the importance of spirituality and spiritual care and their relation with spiritual well-being, nurses' spiritual well-being seems to be improved. On the other hand, Iran's religious attitudes might have helped participants answering the questionnaire items and evaluating themselves in higher level.

A significant direct association was observed between nurses' perception of their spiritual care competence and their spiritual well-being ($p < 0.05$). Put it differently, spiritual well-being increases with their perception of their spiritual care competence. Fatemi et al. reported a significant correlation between nurses' spirituality and patients' satisfaction (20).

Many researchers believe that the capacity of providing spiritual care intensifies with higher awareness of spirituality and spiritual well-being (6). Improved spiritual well-being and higher perception of spiritual care delivery seems to be linked with nurses' performance and spiritual care competence. This should be studied further in future.

Studying the relationship between the mean scores of spiritual care competence and spiritual well-being with nurses' individual characteristics disclosed a significant difference between the type of employment and attending workshops ($p < 0.05$). According to ANOVA and Tukey test results, such difference was observed in working as formal nurses. Formal nurses got higher mean scores for spiritual well-being and the perception of their spiritual care competence. This indicates that formal nurses have higher level of spiritual health and competence than other groups. Maslow has specified the last category of the basic needs pyramid to ego ascendancy. He believes that those with satisfied low level needs may achieve deeper needs (21). Frankle and Travellbee regard spiritual needs as the deepest ones in human being. If people can identify such needs, they will be able to moderately act at the time of crises and find the meaning, value, goal and the hope of their life (8). Formal nurses seem to identify a degree of such deep spiritual needs and seek to satisfy them. The t-test results also show a significant difference between attending workshop and the scores of spiritual health and the perception of spiritual care competence. This means that those who had participated in courses and workshops on spiritual well-being and spiritual care received higher scores. Ours results agree with what Sabzevari et al. found on this subject (8). Regarding the effect of participating in morality workshops on spiritual well-being and spiritual care, hospitals are suggested to provide the required ground for nurses to participate in training courses, workshops and congresses on spiritual well-being

## Conclusion

As to the association between the spiritual well-being and nurses' perception of their spiritual care competence, improved spiritual well-being increases the nurses' perception of their spiritual care delivery to patients. Therefore, it is necessary to hold training workshops and courses for increasing the nurses' spiritual well-being and their competence in providing spiritual care within training programs delivering health and treatment services.

**Limitations:** One of the research limitations was that this research was conducted only on a group of nurses in Tabriz and this sample is not representative of large nurses' society. Future study can be for other areas' nurses with different culture and religious beliefs. Qualitative research can be promising in implementing higher spiritual care for patients and promoting competence of nurses.

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# One year experience of emergency service in patients with penetrating head trauma due to firearm

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## Abstract

**Objective:** We aimed to share the features of 45 patients with firearm injuries related head traumas and our experiences in their treatments.

**Methods:** Our cases consisted of 36 males 45 patients in total between the ages of 18-65, who were brought to the emergency service of our hospital due to firearm injuries. For this retrospective study, it was accessed to the patient data from the archival records of our hospital. The demographical data of the patients like age and gender, and the records such as type of injury, injured area in head, diagnosis, treatment and follow ups were reviewed.

**Results:** There were sinus injury related epidural haemorrhages in 8 of patients who underwent urgent surgical intervention (17.8%). In 18 of the patients (39.95%) who underwent surgery had supratentorial injuries and 7 (15.55%) had infratentorial injuries. All these 25 patients (55.50%) who underwent surgery had multiple intracranial injuries (compression fracture + subdural haemorrhage + contusion + pneumocephalus + SAH + brain edema). Four of these 6 patients with multiple injuries had abdominal injuries. Two patients had haemopneumothorax. There were vertebra and extremity injuries in 2 patients with abdominal injuries.

**Conclusions:** Brain injuries occurring with the firearm head injuries are seen as multiple injuries and their rate of mortality is quite higher.

**Keywords:** Head Injuries, Firearm, Penetrating, Surgical Intervention

## Introduction

Head traumas take an important place among the physical traumas caused by a variety of reasons. Head trauma accompanies to 50% of deaths based on all traumas and constitutes a substantial part of trauma related death cases (1).

Two types of accidents that causes to bodily injuries typically accompanied by head traumas occurs in our region frequently. The first type is the traffic accidents connected with commonly used motorcycles and the second type is the traumas related to falling down from the top of the flat roofed houses, which are used for a variety of reasons in summer months. In line with the precautions to be taken for these reasons, it is thought that the rate of such traumas will decrease with the modification of the physical environment.

The types of injury in case of war occur through high energy weapons, bombs and cluster bombs. Considering the main purpose of producing such weapons is to kill, the severity of injuries in war is estimable. While injuries occurring in such environments end up with death, the survival of those who reach to hospitals alive for treatment is a struggle against weapons produced to kill.

In this study, we aimed to share the features of 45 patients with firearm injuries related head traumas and our experiences in their treatments

## Material and Methods

Our cases consisted of 36 males 45 patients in total between the ages of 18-65, who were brought to the emergency service of our Hospital due to firearm injuries between August 2012 and September 2013 (M=80% and age average=28,2). For this retrospective study, it was accessed to the patient data from the archival records of our hospital. Only the patients with head trauma or multiple organ injuries accompanied by serious head trauma were involved in the study. Patients without head traumas were excluded from the study.

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The demographical data of the patients like age and gender, and the records such as type of injury, injured area in head, diagnosis, treatment and follow ups were reviewed.

## Findings

When they were brought to the emergency service, all patients had undergone brain computerize tomography (BCT). Urgent surgical interventions were implemented to 33 of these 45 patients (73.3%) (Table). There were sinus injury related epidural haemorrhages in 8 of these patients who underwent urgent surgical intervention (17.8%). There were sagittal sinus injuries in 6 and transverse sinus injuries in 2 of these patients.

All patients with sinus injury were operated and their postoperative follow ups and treatments were performed in the intensive care unit, and they were all lost on the postoperative 1st - 9th days during their intensive care unit follow ups.

In 18 of the patients (39.95%) who underwent surgery had supratentorial injuries and 7 (15.55%) had infratentorial (posterior fossa) injuries. All these 25 patients died while they were being followed up between the postoperative 5th and 13th days. These 25 patients (55.50%) who underwent surgery had multiple intracranial injuries (compression fracture + subdural haemorrhage + contusion + pneumocephalus + SAH + brain edema). Four of these 6 patients with multiple injuries had abdominal injuries. We maintained General Surgery, abdominal surgical intervention and then cranial intervention in 3 of 6 patients with coexisting abdominal injuries in the same session. A patient with grade 2 liver injury was suggested clinical follow up without the need for general surgery.

Two patients had haemopneumothorax and one was implemented right tube thoracostomy and the other was implemented bilateral tube thoracotomy. Also, there were vertebra (lomber-1 in one and lomber-5 in the other) and extremity injuries (humerus in one and both femur and tibia fractures in the other) in 2 patients with abdominal injuries. 2 patients with extremity injuries were evaluated by orthopedists in the emergency service. Urgent surgery was not planned.

Both were implemented splinting in the emergency service. Immediate treatments were not preferred for these 2 patients due to their bad general conditions.

Due to the type of firearm injuries occur mostly through high energy weapons, 36 of 45 patients died as a result of these injuries, while 5 patients were discharged with motor deficit. 4 patients were transferred to infection diseases due to meningitis

**Image 1 A, B.:** Foreign body from the shrapnel in the left parietal region with part a result of parenchymal injury, small bone fragments, bleeding and contusions in areas considered

**Table 1.** Cranial injuries caused by firearms

| Operated n=33 (%73.3) | | | Non-operated n=12 (%26.7) | |
|---|---|---|---|---|
| **Sagittal sinus injuries** | **Complicated injury** | | | |
| Dural sinus injury + epidural haemorrhage | Supratentorial haemorrhage (Compression fracture + subdural haemorrhage + contusion + pneumocephalus + SAH + brain edema) | Infratentorial haemorrhage (Compression fracture +contusion +pneumocephalus + brain edema) | Subarachnoid Haemorrhage + pneumocephalus | Contusion + pneumocephalus + SAH + cerebral edema |
| **n=8, (%17.8)** | **n=18, (%39.95)** | **n=7, (%15.55)** | **n=3, %6.6** | **n=9, %20.1** |

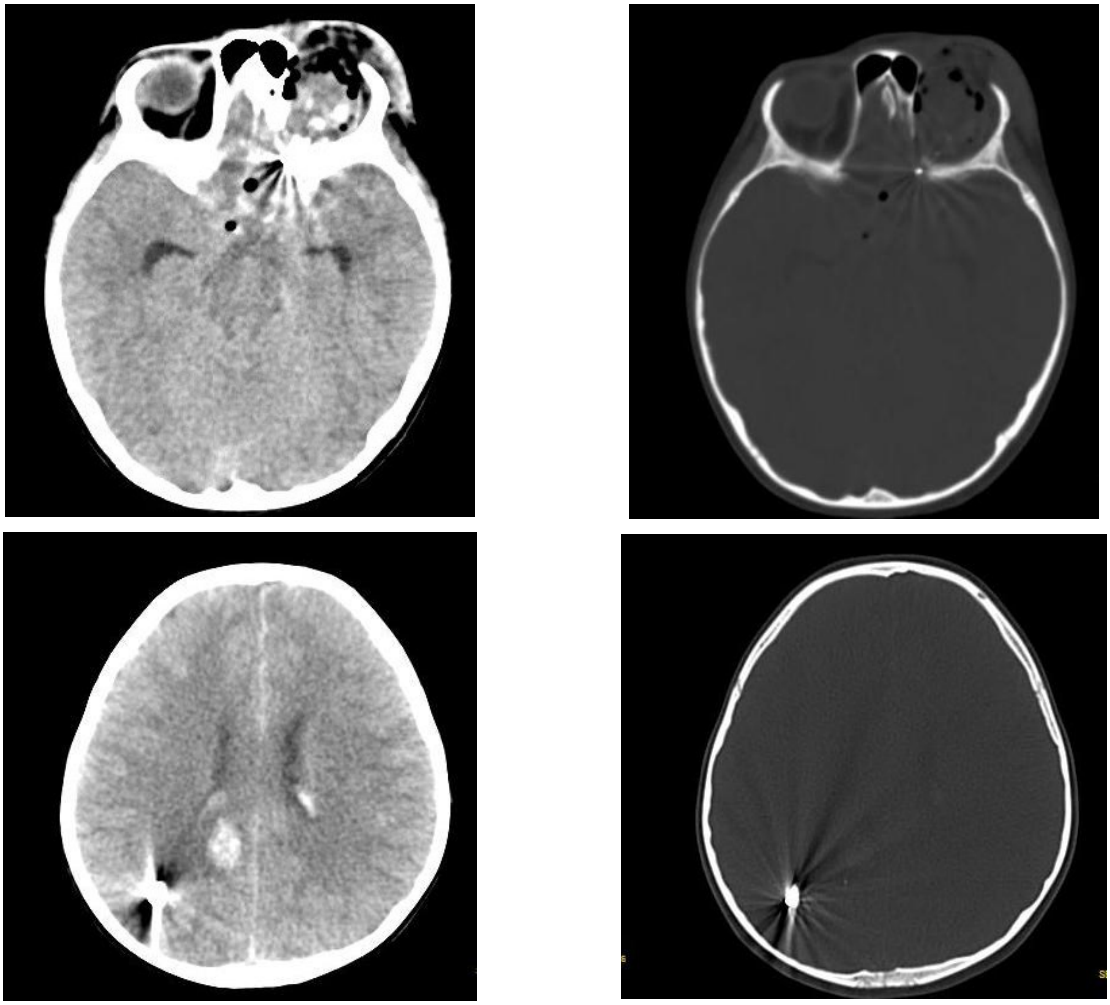

**Image 2 (A,B,C,D):** Foreign body left orbital gunshot wounds to the right pariatooksipital region extending from the inner wall. It is seen outside the left eye, bone fragments extending into the parenchyma, contused area and especially intraventricular hematoma seen in the area.

## Discussion

As a result of a shot through the head, various degrees of injuries occur according to the type of weapon, shooting distance, angle and speed of bullet entry to the head (10). Various degrees of skull fractures occur in the area of bullet entry to the head in connection with the bullet mass and speed. Bullet leads to both damage through direct effect and damage to distant tissues through shock waves by dragging the pieces of fractured bones (9).

Penetrating head injuries are seen in males more in the literature searches (2,4,5,8,11,14). In our study, such injuries were also determined higher in males in comparison to females (males: 80% and females: 20%).

The reasons for this may be males to be keen on weapons more, carry guns more and fight directly in front in wars. In our study, a significant part of the cases were patients coming from Syria, where war continues 50 km away from our hospital.

The purpose of the surgical intervention in firearm head injuries is to implement decompression in intracranial pressure increase and clean the injury to prevent infections that could occur due to foreign substances and necrotic tissues. We implemented surgery to 33 patients. There were sinus injuries in a substantial part of the patients we implemented surgery and urgent surgery was implemented to these patients for sinus repair. Combined injuries were detected in the CT examinations of the other patients underwent surgery.

Dural sinus injuries are seen in 10% of firearm injuries (7). In our study, the dural sinus injuries were determined a bit higher comparing to the literature (17.8%). This can be explained with a substantial part of the patients involved in our study to have injuries from a war environment.

Subarachnoid haemorrhage (SAH) is a pathology that is frequently seen in penetrating head traumas. It was reported 31% to 80% in researches in the literature.

This rate was determined as 93% in the study performed by Ziyal et al. (15). And in our study, it was determined at the rate of 82.2%. The reason for observing a high rate of SAH can be bullet entering the head to move through the parenchyma and lead to vascular injuries. Even if SAH is not seen alone frequently, it is often observed in patients with multiple intraparenchymal injuries.

With the effect of the bullet, pieces of bone and hairs, and foreign substances like stones and grains on the ground, where wounded person fell, are carried to brain parenchyma tissue. If patient had undergone surgery, these foreign substances must be cleaned as much as possible during the operation. Even if the wounded person is operated, the brain tissue cannot be cleaned off these foreign substances. Foreign substances can be reason for infection and meningitis and they frequently require antibiotherapy during the follow up periods. The BOS leak occurring as a result of the penetrating injuries also poses a great risk for meningitis and intracranial abscess (4, 3, 13). The second surgical intervention to remove foreign substances may cause increase of neurological symptoms and bacterial propagation (12). In our cases, any second intervention was not performed in order to remove foreign substances.

Arterial dissection, dural venous sinus injuries may occur following the firearm head injuries (15). SAH may develop following the vascular injuries. Both vascular injuries and SAH increase the rate of mortality and morbidity in penetrating head injuries due to reasons such as pneumocephalus, compression fracture and brain edema (6). The mortality following the firearm injuries was determined between 16% and 32%. In our study, this rate was determined much higher as 80%. Patients involved in our study to come from the nearby war territory and the use of high energy weapons and cluster bombs during the war can be the reason for this higher mortality.

## Conclusion

Brain injuries occurring with the firearm head injuries are seen as multiple injuries and their rate of mortality is quite higher.

**Conflict of Interest:** The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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# Could Computer Game Players React as Quick as Table Tennis Athletes and Perform the Right Action?

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## Abstract

**Objective:** Table tennis athletes have short reaction times and specialized skills. Computer games may also decrease reaction times. However the actions of the computer game players are limited to mouse/keyboard/joystick use. The objective of the study is to compare the reaction times and the achievement levels on selective action array of athletes and players.

**Material and Methods:** 10 medical school students that played computer games 10 hours a week for at least 5 years, and 9 table tennis athletes that were trained 10 hours a week for at least 5 years were included in the study. Right/left-hand/foot reaction times against auditory and visual stimuli were recorded for each subject. Selective action array was implemented utilizing a table tennis robot. The robot was set up to send 120 balls in different colors, to different points on the table, in random colors and 90 balls per minute at the same speed. The subjects were asked to ignore the white balls, to touch the yellow balls and to hold the pink balls. The actions that the subjects took, or did not take against each ball were transformed into points.

**Results:** It was found that the mean reaction time for athletes was 196.8ms and 196.0ms for the players. The selective action array total points were similar in athletes and players. While the athletes scored better with yellow and pink balls, players scored better with the white balls.

**Conclusion:** The similar scores and reaction times by players and athletes could be interpreted that it could be beneficial to prioritize visual perception, attention and focusing in selecting athletes and in designing training programs.

**Key words:** Computer games, table tennis, reaction time, selective action array

## Introduction

Table tennis is one of the sports that are technically difficult to learn and play. The athlete has to perceive the ball within a small space, in various rotations, aiming at different points on the table in various speeds, and perform the correct action to send the ball to the opponent's side to force him to fail. This sport where the ball could reach high speeds within a range of 3-5 m is considered among reaction sports (1).

Table tennis table is 152.5 by 274 cm and the diameter of the table tennis ball is 40 mm and it weighs 2.7 grams. Measurements taken with professional athletes demonstrated that the maximum speed of the ball could reach 31 m/s (2), and with that speed it could traverse the table within approximately 90 ms. With an average speed of 10 m/s, the time that the ball covers the length and back between two athletes that stand 30 cm from the table is approximately 300 ms.

Although the maximum speed that the ball could reach in table tennis is almost half the speed it could reach in other sports played with racket such as tennis, squash and badminton, the relatively shorter space between the two athletes in table tennis requires a relatively shorter time of reaction by table tennis athletes when compared to other racket sports athletes and many other sports athletes and to individuals that do not participate in sports (1,3-6).

Computer games play an increasingly important part in our lives and became one of the most prevalent entertainment tools of the younger generation. During recent years, international tournaments for computer games are organized and even the term electronic athlete / e-athlete is being used in the literature (7-11).

The intrinsic concept of movement in sports does not completely exist in electronic sports, which became the main topic of the argument on whether these games should be considered as sports at all.

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Success in computer games is related to attention and concentration. Especially in action games, it is an expected fact that the visual perception of the players should be advanced and their reaction times should be short. However, the actions of these players could not reach beyond the use of mouse, keyboard and joystick. The objective of the study is to compare the reaction times for advanced level table tennis athletes and computer game players and the accuracy rates of the required actions utilizing a new test to determine selective reactions of table tennis athletes and computer game players

## Material and Methods

The study was conducted in Uludağ University, Faculty of Sport Sciences, during the months of March and April 2013. An approval was obtained from the "Uludağ University, Faculty of Medicine, Clinical Research Ethics Board". The subjects were included in the study after obtaining their consent.

### Study Groups

Professional or amateur table tennis athletes, who were licensed in various table tennis clubs in Bursa, Turkey, were provided information on the study and participated in the study on a voluntary basis. The criterion for acceptance in the study was at least 10 hours training per week for at least 5 years. 9 table tennis players with a mean age of 20.1 years that met the criterion participated in the study [Table Tennis Athletes Group (TT)].

Computer game players that met similar conditions with the table tennis athletes were scanned among university students and it was found that mostly medical students met the criterion. Instead of forming a mixed group from different departments, a homogenous group was formed including only Faculty of Medicine students. Since the objective of the study was to compare advanced table tennis athletes and computer game players, educational status of table tennis athletes and computer game players was not considered as a significant issue for the assessed parameters and assessment methods. An announcement was made for freshmen, sophomore and junior Faculty of Medicine students and volunteers that met the study criteria were included in the study. 10 computer game players with a mean age of 19.6 years, who were playing computer games for at least 10 hours per week for at least 5 years participated in the study [Computer Game Players Group (CG)].

It was made sure that the subjects did not suffer from an active disease and the tests were implemented at the same hour of the day. Subjects with acute infections or had taken alcohol within one day of the tests were excluded from the study.

### Reaction Time Measurements

Reaction time was measured using specialized equipment produced for these tests. This equipment consisted of a button to enter the stimulus, a second button to determine the type of the stimulus (sound or light) and a digital screen where the reaction time could be read. Sound stimulus was given using a loudspeaker mounded on the equipment; light stimulant was given by a LED lamp, connected to the equipment with cables and mounted on a support that sits exactly at the opposite of the subject. At one end of the apparatus shaped like a "U" sits the light source and at the other end, there is an optic sensor. Placing the hand or foot of the subject in the middle of the apparatus would prevent the light to reach the sensor. After the stimulus is given, subject moving hand or foot at east for 1 cm would close the circuit and the measurement is taken.

Measurements were taken in a dimly lit and silent room. First measurements were taken with the sound stimuli. After right hand/left hand auditory measurements, left hand/right hand light measurements were taken. Then, feet measurements were taken. The experiment was completed after right foot/left foot light measurements and left foot/right foot sound measurements were implemented. The stimuli were initiated by the researcher in random intervals; constant intervals were avoided. Before the actual measurement, participants were informed about the procedure, the sound and the light were introduced and a trial was conducted.

10 different measurements were taken for each stimulus (sound/light) and for each extremity. Maximum 2 values and minimum 2 values among these 10 measurements were ignored and the mean of the remaining 6 measurements was accepted as the reaction time. A total of 80 stimuli were given to each subject within 3 minutes.

Reaction times were compared among the two groups based on left-right, hand-foot and light-sound.

### Selective Action Array

Selective action array was implemented using a table tennis robot (Butterfly/Amic-3000). The robot was set up to send a total of 120 balls in different colors (white, yellow and pink, 40 each) to different points on the table, with the same speed, in random colors and 90 balls per minute. The subjects were asked to ignore the white balls, to touch the yellow balls and to hold the pink balls after the balls hit the table once and using their dominant hands. It was made sure that the subjects did not witness the experiment previously. After the initial test, the second experiment was recorded on video.

The actions that the subjects committed or did not commit were transferred into points using a scoring

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scale within the range of 0 to 6 points (Table 1). Results were given as total points and the percentage success of the action worth 6 points for each color of ball, namely "6 points success percentage."

### Statistics

All statistical analyses were performed with IBM SPSS V. 22.0. The results were given as mean ± standard deviation, and minimum and maximum values. Shapiro Wilk test was used as normality test. Comparisons of intra-group dependent variables are conducted using Wilcoxon signed rank test when data were not normally distributed. Comparisons of inter-group continuous variables were conducted using Mann-Whitney U test when the data were not normally distributed. Significance level was accepted as $p<0.05$.

## Results

Mean age for the groups, hand/foot preferences and the period that the subjects actively played computer games or engaged in sports were presented in Table 2.

There was no significant difference between the groups based on their age and the period that they actively played computer games or were engaged in sports.

Reaction times are displayed in Table 3. The average of 8 reaction times given to each extremity and stimulus was given as "mean reaction time".

The most rapid reactions were those given to sound using hands, while the lowest ones were given to light using left foot. Values fewer than average 200 ms were obtained in 5 of the total 8 different reaction times for both groups. There was no significant difference between the reactions of the subjects given to sound with their dominant hands, and right or left hand sound reaction times.

Mean reaction times for both groups were very similar (TT Group 196.8 ms; CG Group 196.0 ms).

Comparisons conducted within groups are displayed in Tables 4 and 5. Right side was found as more rapid in reactions given to sound using foot in CG group and given to light using hand in TT group. There was no difference between right and left sides in other comparisons.

In total, reactions given with hand were more rapid than reactions given with foot with an average 15.7 ms. Reactions given to sound were more rapid than reactions given to light with an average 20 ms.

There was no significant difference between table tennis athletes and computer game players based on the reaction times for each extremity or stimulus.

Table 6 demonstrates the total points obtained in selected action array and 6 points success percentages for each colored ball. No significant difference was observed between the groups.

While table tennis athletes demonstrated the best success rates with yellow and pink balls, computer game players were most successful with the white ball.

**Table 1:** Scoring Scale.

| **White Ball > No reaction** | **Points** |
|---|---|
| No reaction | **6** |
| Reacted but did not touch | **4** |
| Touched | **2** |
| Held | **0** |
| | |
| **Yellow Ball > Touch** | |
| No reaction | **0** |
| Reacted but could not touch | **4** |
| Touched | **6** |
| Held | **2** |
| | |
| **Pink Ball > Hold** | |
| No reaction | **0** |
| Reacted but could not touch | **2** |
| Reacted but could not hold | **4** |
| Held | **6** |

**Table 2:** General characteristics of computer game players (CG) and table tennis athletes (TT).

| **Groups** | **CG Players** | **TT Athletes** |
|---|---|---|
| **n** | 10 | 9 |
| **Age (year)** | 19.6±1.5 (18-22) | 20.1±4.9 (15-30) |
| **Active time (year)** | 10.6±3.4 (6-15) | 12.3±4.8 (5-20) |
| **Left hand** | 1 | 2 |
| **Left foot** | 2 | 0 |

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**Table 3:** Reaction times. (Red areas depict minimum values, blue areas depict maximum values, and green areas depict values below 200 ms.) CG: Computer game players group; TT: Table tennis athletes group.

| | | | | CG | TT |
|---|---|---|---|---|---|
| Reaction time (ms) | Visual (Light) | Hand | Right | 201.0 ± 20.2 (172.0-239.7) | 189.9 ± 7.8 (179.8-202.5) |
| | | | Left | 198.4 ± 15.5 (182.8-221.3) | 200.8 ± 13.2 (178.8-218.0) |
| | | Foot | Right | 213.3 ± 13.7 (182.5-228.2) | 212.0 ± 10.7 (191.8-232.5) |
| | | | Left | 215.2 ± 7.3 (207.8-228.2) | 220.5 ± 14.5 (199.7-246.5) |
| | Auditory (Sound) | Hand | Right | 176.1 ± 15.2 (156.5-203.7) | 180.0 ± 10.0 (166.3-191.3) |
| | | | Left | 183.1 ± 21.1 (151.2-210.7) | 179.0 ± 17.4 (159.5-208.8) |
| | | Foot | Right | 184.9 ± 13.9 (168.0-215.5) | 196.1 ± 16.9 (175.7-219.5) |
| | | | Left | 196.1 ± 19.7 (171.7-232.3) | 195.8 ± 16.4 (175.0-228.2) |
| **Dominant Hand / Sound** | | | | 177.5 ± 15.5 (156.5-203.7) | 182.5 ± 10.3 (166.3-196.2) |
| **Mean Reaction Time** | | | | 196.0 ± 12.8 (175.6-212.5) | 196.8 ± 9.6 (182.6-212.9) |

**Table 4:** Intra-group comparisons among the computer game players (CG) group.

| CG | | | | n | p | |
|---|---|---|---|---|---|---|
| **Sound** | Right hand | **X** | Left hand | 10 | >0.05 | |
| | Right foot | **X** | Left foot | 10 | **0.022** | First of the two differences between right and left. Right foot is 11.2 ms quicker in average. |
| | Hand | **X** | Foot | 20 | **0.008** | Hand is 10.9 ms quicker than the foot in average. |
| | | | | | | |
| **Light** | Right hand | **X** | Left hand | 10 | >0.05 | |
| | Right foot | **X** | Left foot | 10 | >0.05 | |
| | Hand | **X** | Foot | 20 | **0.001** | Hand is 14.5 ms quicker than the foot in average. |
| | | | | | | |
| **Right Hand** | Sound | **X** | Light | 10 | **0.005** | |
| **Left Hand** | Sound | **X** | Light | 10 | **0.047** | |
| **Hand** | Sound | **X** | Light | 20 | **0.001** | Sound is 20.1 ms quicker than light. |
| | | | | | | |
| **Right Foot** | Sound | **X** | Light | 10 | **0.005** | |
| **Left Foot** | Sound | **X** | Light | 10 | **0.013** | |
| **Foot** | Sound | **X** | Light | 20 | **0.0001** | Sound is 23.7 ms quicker than light. |
| | | | | | | |
| | Hand | **X** | Foot | 40 | **0.0001** | In total, hand is 12.7 ms quicker than the foot in average. |
| | Sound | **X** | Light | 40 | **0.0001** | In total, sound is 21.9 ms quicker than light in average. |

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**Table 5:** Intra-group comparisons in table tennis athletes (TT) group

| TT | | | | n | p | |
|---|---|---|---|---|---|---|
| **Sound** | Right hand | **X** | Left hand | 9 | >0.05 | |
| | Right foot | **X** | Left foot | 9 | >0.05 | |
| | Hand | **X** | Foot | 18 | **0.001** | Hand is 16.5 ms quicker than the foot in average. |
| | | | | | | |
| **Light** | Right hand | **X** | Left hand | 9 | **0.021** | Second of the two differences between right and left. Right hand is 10.9 ms quicker in average. |
| | Right foot | **X** | Left foot | 9 | >0.05 | |
| | Hand | **X** | Foot | 18 | **0.0001** | Hand is 21.0 ms quicker than the foot in average. |
| | | | | | | |
| **Right Hand** | Sound | **X** | Light | 9 | **0.028** | |
| **Left Hand** | Sound | **X** | Light | 9 | **0.008** | |
| **Hand** | Sound | **X** | Light | 18 | **0.0001** | Sound is 15.8 ms quicker than light in average. |
| | | | | | | |
| **Right Foot** | Sound | **X** | Light | 9 | **0.021** | |
| **Left Foot** | Sound | **X** | Light | 9 | **0.008** | |
| **Foot** | Sound | **X** | Light | 18 | **0.0001** | Sound is 20.3 ms quicker than light in average. |
| | | | | | | |
| | Hand | **X** | Foot | 36 | **0.0001** | In total, hand is 18.7 ms quicker than the foot in average. |
| | Sound | **X** | Light | 36 | **0.0001** | In total, sound is 18.1 ms quicker than light in average. |

**Table 6:** Total points and 6 points success percentages obtained in selective action array. CG: Computer game players group; TT: Table tennis athletes group.

| | Total point | 6 points success percentage | | |
|---|---|---|---|---|
| | | White | Yellow | Pink |
| **CG** | 156.3 ±10.1 (139.6-167.8) | 90.0 ± 7.9 (73.1-100.0) | 79.8 + 10.7 (58.1-92.6) | 56.6 ± 21.4 (8.3-79.4) |
| **TT** | 158.1 ±10.8 (140.6-172.8) | 87.6 ± 10.3 (69.7-100.0) | 81.3 ± 11.5 (53.3 - 93.3) | 68.8 ± 17.7 (44.4-89.3) |

## Discussion

In this study, where the accuracy rates for the selective reactions and reaction times of computer game players and table tennis athletes were compared, the reaction times of athletes and players were found to be quite similar. For the selective action array where the selective reactions were evaluated, table tennis athletes obtained the best scores in total points and points with the yellow and pink balls, computer game players had more success with the white balls.

Measurement of the reaction times under 8 different conditions puts this study in a unique situation among other studies (3-6). Evaluation of all extremities both visually and aurally and obtaining a mean reaction time made it possible to analyse the subjects as a whole. The subjects went below the mean value of 200 ms in 5 of 8 different situations in both groups.

Right hand-light reaction time for table tennis athletes was significantly shorter than left hand-light reaction time. 7 out of 9 table tennis athletes had a dominant right hand. In table tennis sport, the ball approaching from the opposite side is perceived visually and the reaction is given using the racket. Naturally, a more rapid response while using the dominant side could be expected.

However, the lack of such a difference in reactions given as a response to sound stimuli demonstrates that visual perception is dominant in the sport of table tennis.

The second significant difference between the right and left sides was observed in the reactions given by the right foot as a response to sound stimuli among the computer game players when compared to the left side foot. It was difficult to explain this difference of 11 ms.

This difference could be explained by the existence of computer games that assign a special function especially to the right foot. However, although this situation was questioned in the study, this occurrence was not identified.

The fact that the standard deviations for the right hand reaction times for both auditory and visual stimuli by table tennis athletes had the lowest values when all analyses were compared demonstrated without doubt that they could concentrate consistently for longer periods of time and the effects of the sports on the hand utilized for these athletes, most of which were right-handed. The significance of visual perception in both the sport of table tennis and computer gaming is obvious. The right-hand visual reaction times demonstrated that table tennis athletes were an average of 11 ms more quick than the computer game players (189.9 ± 7.8; 201.0 ± 20.2). This could be explained by the effects of the sport on muscle coordination.

Several studies demonstrated that table tennis athletes had lower reaction times when compared to other racket sports' athletes and individuals that do not participate in sports (3-6). However, the findings of this study did not reflect a significant difference between the reaction times of table tennis athletes and computer game players. This result shows the skills of computer game players in maintaining the game they play by concentrating on the immediate action, just like an athlete, using responses to minute visual and auditory stimuli on the computer screen and by implementing the accurate action with the accurate timing. It was considered that by keeping the attention and readiness of the player intact continuously, this process enables the players to maintain their reaction times and responses to the selective reaction dynamically.

While the similarity of the reaction times of the computer game players and table tennis athletes was an expected finding, the similarity in achievement scores in selective action array was not. The finding that the computer game players achieved better scores with the white balls and table tennis athletes achieved better scores with yellow and pink balls demonstrated that the array utilized in this study was set up accurately. But the lack of difference could be due to the limited number of subjects. The fact that table tennis athletes react to each and every ball that their opponent sends was totally contradictory to the action they should take with the white balls in the array set up in the study. Computer game players recognized this difference better than the athletes did. However the action requested by the subjects for the yellow and especially the pink balls was a more difficult one to perform accurately. Table tennis athletes, who are aware of the exact bounce rates of the ball and with better coordination, performed better with the yellow and especially the pink ball, albeit not significantly.

The gradual nature of the success rates for different coloured balls, and the highest success rates with the white balls and the lowest success rates with the pink balls demonstrated the difference between the degrees of difficulty between the balls with different colours. Based on the degree of difficulty of the action, white ball was the easiest, yellow ball was with medium level of difficulty and the pink ball was the hardest.

The reaction time and selective action array applications used in the study required very high levels of attention and concentration within a very short period of time. After an interruption during the application, it was very difficult to concentrate again. Reaction time is closely related to attention and concentration. Thus, the most significant effect of training in competitive sports is to learn how to concentrate and focus in the game. Reaction time in sports is considered as a motor trait that could be developed via training (12-14). Effect on the cognitive function of computer games is a fact now accepted (8,15,16).

## Conclusion

The findings of this study demonstrated expected reaction times and unexpectedly good selective action array achievements levels with computer game players. This result could be interpreted as computer games and/or advanced computer programs developed for sports could support to decrease reaction times, to increase visual perception and attention and to retain concentration for extended periods of time in training of the athletes. By affiliating appropriate computer games/software with training programs, in addition to improving cognitive features such as reaction time, attention, concentration and visual perception, rapid and accurate adaptation to new situations and the skill to develop strategies could be achieved among athletes. Especially in injury and rehabilitation periods of the athletes, computer games/software could be used to retain existing capabilities.

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# Diet induced weight loss reduces mean platelet volume in people with obesity

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## Abstract

**Objectives:** To investigate is there a relationship between obesity parameters, mean platelet volume (MPV) and neutrophil lymphocyte ratio (NLR), and to examine is there a change in MPV and NLR level with weight loss.

**Material and Methods:** The retrospective study consisted of two groups as the group losing weight after 24 weeks of diet (WLG) and the control group not losing weight (CG). Body mass index (BMI), MPV, NLR and lipid values of each group were recorded at the beginning and at the end of the study.

**Results:** The study consisted of 186 individuals 94 of whom were in WLG and 92 were in CG. There was a statistically significant positive correlation between the initial value of MPV and BMI in WLG ($p < 0.05$). There was a significant difference existed in the initial and final lipid parameters of WLG ($p<0.0001$). Changes in initial and final MPV values in WLG and CG were different from each other ($p < 0.01$). The difference between the initial and final MPV values and BMI values in WLG was statistically significant ($P < 0.001$). No significant correlation was found between obesity and weight loss with NLR.

**Conclusions:** There was a statistically significant correlation between MPV and BMI. MPV levels decreased in obese individuals with weight loss. No correlation existed between BMI and NLR.

**Keywords:** Diet, weight loss, mean platelet volume, neutrophil lymphocyte ratio, obesity, body mass index

## Introduction

The importance of inflammatory markers is increasing as coronary artery diseases are currently the most common causes of death in the world, which is related to inflammation (1). Therefore, a number of studies have recently been conducted on inflammation and biomarkers which reflect inflammatory conditions (1, 2). In obesity whose prevalence is gradually increasing due to the decrease in physical activity and increase in high-energy food consumption, body mass index (BMI) above normal increases mortality and morbidity (3, 4). According to World Health Organization (WHO), an individual is defined as overweight (preobese) if BMI is above 25 kg / m² and as obese if BMI is above 30 kg / m² (4). Furthermore, obesity plays an important role in the formation of many pathological conditions. The most frequent conditions can be listed as cardiovascular disease, cerebrovascular disease, hypertension (HT), diabetes mellitus (DM), dyslipidemia, infertility, certain types of cancer such as prostate, breast and colon (5).

Although obesity-related causes of inflammation are not fully understood, it is estimated that it occurs due to direct activation of immune cells in the circulatory system (6, 7).

The inflammatory process also occurs in liver, pancreas, adipose and muscle tissue with circulation. Adipose tissue has both initiatory and contributory role in systemic inflammation (6, 7).

Mean platelet volume (MPV) associated with cardiovascular and cerebrovascular diseases and accepted as an indication of atherosclerosis is a parameter used to evaluate the size and activity of platelets (8). The volume of activated platelets increases, which causes MPV rise. Large platelets including more granules and produces more vasoactive and prothrombotic factors make more aggregation compared to small platelets (9, 10). MPV is known to increase in acute myocardial infarction, acute ischemic stroke, preeclampsia and renal artery stenosis (8). Additionally, in some studies, it has been discovered that MPV is positively correlated with

BMI and high in obesity (11). In recent studies on humans and animals, it has been demonstrated that the change in neutrophil and lymphocyte numbers poses a potential risk for the development of obesity-related metabolic disorders (12, 13).

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It is believed that Neutrophil / Lymphocyte ratio (NLR) is a marker of systemic inflammation and has a prognostic significance for cardiovascular diseases. These hematological markers are important in terms of making assessment without creating extra costs during the complete blood count (14). Although there are a number of studies conducted on the relationship between MPV and obesity and no common conclusion is drawn. In this study, our aim is to investigate the relationship between obesity parameters, which are known to accelerate the development of atherothrombosis and the incidence of cardiovascular mortality and morbidity, MPV and NLR. We also aim to examine whether there is a change in MPV and NLR levels with weight loss thanks to a diet plan in obese individuals.

## Material and Methods

This study was conducted retrospectively after the approval of Ethics Committee of Balıkesir University School of Medicine was granted. When individuals go to Balıkesir University School of Medicine Health Application and Research Hospital with complaints related to being overweight, the arterial blood pressure is measured and physical examination is performed. After those procedures, complete blood count and biochemical tests (12 hour fasting glucose, total cholesterol, LDL cholesterol, HDL cholesterol, triglycerides, and HOMA-IR TSH) are performed routinely. For complete blood count, blood sample is taken from the antecubital vein, put into tubes with EDTA and studied with Beckman Coulter LH 780 Hematology Analyzer (Beckman Coulter, Inc., CA, USA) device within an hour. If metabolic syndrome (MS), DM, and dyslipidemia are detected in those individuals medical treatment is given and they are directed to diet clinic. Measuring weight and height, BMI of obese individuals are calculated through weight (kg) / (height) ² ($m^2$) formulas, and appropriate nutrition programs are given by dieticians. Weight changes of these individuals are followed for 12-week periods. During the controls in internal medicine clinic, detailed physical examination, complete blood count and biochemical tests are performed, and individuals meet the dieticians again. We scanned the files of obese individuals who were directed to dieticians between 2013-2015, had ⩾ 30 kg / m2 body mass index (BMI) according to WHO classification, and followed at least 24 weeks of dieting. The individuals who were found to have DM (fasting blood glucose ⩾126 and hemoglobin A1c> 6.4%), cardiovascular disease, HT (systolic blood pressure ⩾140 mm Hg diastolic blood pressure ⩾90), cerebrovascular disease, liver failure, renal failure, smoking and alcohol habit were excluded from the study. On the other hand, individuals who were eligible for the study were divided into two groups as weight loss group (WLG) including individuals with body weight change higher than 5%, and the control group (CG) consisting of individuals who had weight loss less than 5%. The initial values of WLG and CG were recorded as MPV1, NLR1, BMI1 and the values after 24 weeks were recorded as MPV2, NLR2 and BMI2.

### Diet Plan

Patients' daily energy requirements were calculated according to age, gender, weight and height. A weight loss diet was implemented ensuring that energy intake was above the basal metabolic rate (BMR). Gerrior et al. formulae was used to calculate BMR: "BMR = 247 – 2.67 × age (year) + 401,5 × height boy (meter) + 8,6 × weight (kg)" (15). The diet consisted of 55-60% carbohydrates 12-15 % protein and 25-30 % lipid and the energy value of the diets given ranged between1300-1800 kcal.

**Statistical analysis:** The values of the obese group losing weight as a result of dieting and control group losing weight without diet were evaluated using SPSS software version 20.0 (SPSS Inc, Chicago, IL, USA). Chi square test was used for determining the relations of gender and age between groups. In addition, groups were compared using the Student's t-test. The groups' initial and final results were compared using the Paired sample t test. The correlation between BMI, MPV and NLR was calculated via Pearson correlation test. MPV changes within the group were demonstrated through univariate covariance analysis. $P<0.05$ value was accepted as significant.

## Results

186 obese individuals (153 females, 33 males) appropriate for the study criteria were included in the study. WLG consisted of 94 individuals (79 females and 15 males) between 21-64 years old, while CG included 92 individuals (74 females and 18 males) between 19-64 years old. No difference was found between groups in terms of gender and age distribution ($P>0.05$). Moreover, no significant difference existed between MPV values of males and females ($P>0.05$). The mean MPV1 level of all individuals in the study was found to be 8.38 ± 0.95 while the mean MPV2 was 8.21 ± 0.94. The mean MPV1 of WLG was 8.40 ± 0.95 whereas the mean MPV2 was found to be 7.93 ± 0.84 (Table 1). When the initial BMI values of both groups were compared, a significant difference was found ($p<0.05$). The mean BMI 1 value of WLG was 36.68 ± 5.72, whereas it was 34.62 ± 5.09 for CG. At the end of the study, when the mean BMI 2 of WLG (32.17 ± 5.04) and the

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**Table 1:** The anthropometric measurements and haematological values of non-weight loss and weight loss groups

| | Non weight loss (n: 97) | | | Weight loss (n: 101) | | |
|---|---|---|---|---|---|---|
| | First count | Last count | p | First count | Last count | p |
| **Body weight (kg)** | 89.0 ± 14.2 | 90.5 ± 14.5 | 0.001 | 94.3 ± 15.3 | 82.8 ± 14.0 | 0.001 |
| **BMI (kg/m2)** | 34.6 ± 5.0 | 35.2 ± 5.1 | 0.001 | 36.6 ± 5.7 | 32.1 ± 5.0 | 0.001 |
| **Total cholesterol (mg/dL)** | 224.1 ± 46.7 | 217.7 ± 43.2 | 0.137 | 239.1 ± 55.0 | 190.1 ±39.8 | 0.001 |
| **LDL- cholesterol (mg/dL)** | 138.9 ± 42.2 | 139.7 ± 36.5 | 0.161 | 152. 5± 52.5 | 107.4 ± 33.9 | 0.001 |
| **HDL- cholesterol (mg/dL)** | 50.2 ± 12.1 | 49.6 ± 11.2 | 0.462 | 50.8 ± 11.6 | 56.4 ± 10.4 | 0.001 |
| **Triglyceride (mg/dL)** | 175.1 ± 65.6 | 170.7 ± 65.6 | 0.359 | 190.3 ± 85.8 | 134.0 ± 55.1 | 0.001 |
| **MPV (fl)** | 8.3 ± 0.9 | 8.5 ± 0.9 | 0.023 | 8.4 ± 0.9 | 7.9 ± 0.8 | 0.001 |
| **NLR (%)** | 1.6 ± 0.9 | 1.7 ± 1.2 | 0.405 | 1.8 ± 0.9 | 1.9 ± 0.8 | 0.001 |

BMI: body mass index; LDL: Low Density Lipoprotein; HDL: High Density Lipoprotein;
MPV: mean platelet volume; NLR: neutrophil lymphocyte ratio

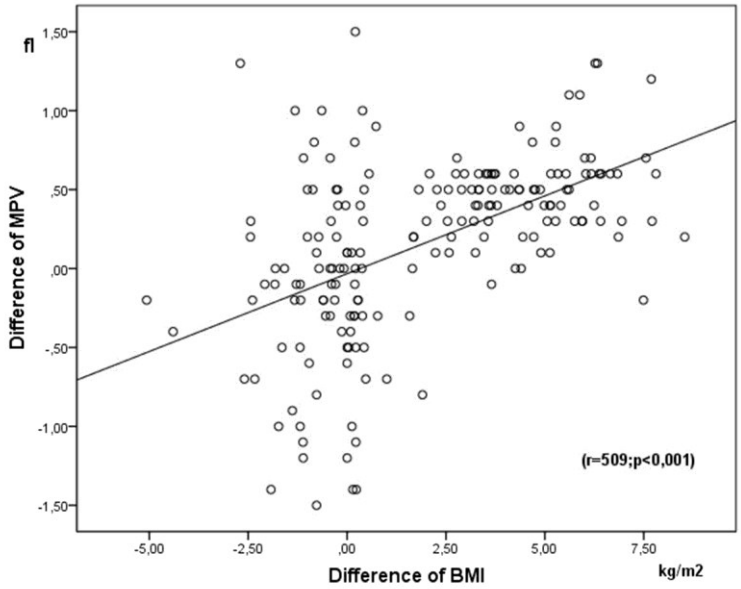


**Figure 1:** The correlation between the initial and final body mass index and mean platelet volume values

mean BMI2 of CG (35.20 ± 5.19) were compared, no significant difference was found (p> 0.05).

While no difference existed in the initial and final lipid parameters of CG (p>0.05), a significant difference existed in the initial and final lipid parameters of WLG (p<0.0001) (Table 1). A positive correlation existed between MPV and BMI values of all individuals in the study (r = 0.140; p =0.05). When this correlation was examined separately for both groups, it was found that there was a significant difference between BMI1 and MPV1 in WLG (r =0.267; p <0.01), whereas no difference was found in CG.

While no difference existed in the initial mean MPV values of each group, a significant difference was found at the end of the study (p <0.001). The reason of this result was to be decrease of MPV in WLG at the end.

It was discovered through univariate covariance analysis test that the change in initial and final measurement of MPV values of each individual in WLG was different from the change in CG (p <0.01).

There was a statistically significant correlation between the initial and final MPV and BMI values of individuals in the study (r = 0.509; p <0.001) (Figure 1). No correlation was found between NLR and BMI for both WLG and CG. Additionally, there was no correlation between weight loss and NLR (p> 0.05).

## Discussion

In previous studies, it was stated that the level of obesity and MS are associated with inflammation and thus cause atherosclerosis (16). MPV which indicates platelet activity is associated with the pathological conditions in thrombopoiesis (16, 17). MPV levels in obese individuals are higher than non-obese individuals.

Coban et al. demonstrated in their study that MPV is higher in obese individuals than non-obese individuals (11). The results of studies examining the relationship of MPV with obesity and MS are incompatible with each other.

In a comprehensive study conducted by Kutlucan et al., it was found that MPV values of obese individuals with MS were different from values of obese individuals without MS (18). They claimed that MPV levels are more affected by obesity than MS. On the other hand, Tavil et al. stated that MPV is higher in MS and the reason for this was that it is related to HT, waist circumference, BMI, and fasting plasma glucose (19).

In literature, there are many studies in parallel with our study investigating the impact of diet on MPV in obese individuals. In the study conducted by Toplak et al., weight loss with hypocaloric diet and low calorie diet was examined. It was found in that study that MPV values increased in the first 8 weeks compared to the initial value, and MPV levels of individuals losing weight after 48 weeks dropped to the initial level. MPV did not change compared to initial level and no change was observed in lipid values (20). In our study, it was found that MPV and lipid values decreased after weight loss. When we compare our study and the study conducted by Toplak et al., it can be said that lipid levels have an important role in the effect of weight loss on MPV levels. In a study conducted by Coban et al., obese and non-obese individuals were compared. They found that MPV values in obese individuals were higher than non-obese individuals, and MPV values measured after weight loss whit diet decreased compared to the initial MPV values (21). However, the non-existence of control group consisted of obese individual without weight loss is the major limitation of that study. Unlike those studies, we investigated the changes in MPV levels of two groups including individuals with weight loss and without weight loss following the same diet. It was discovered that MPV levels decreased in obese individuals even if obesity continued after at least %5 weight losses.

Positive correlation existed between BMI and MPV values of individuals who participated in the study at the beginning. When this correlation is examined separately for both groups, it was discovered there was a significant correlation between BMI and MPV in WLG. However, no correlation existed between BMI and MPV in CG. Coban et al. stated that there was a significant correlation between BMI and MPV levels of obese individuals who lost weight, which is similar to our results (21). In addition, we found a positive correlation between the initial and final weight changes of individuals and the initial and final BMI changes of individuals (Figure 1). Accordingly, it can be said that MPV values decrease when individuals lose weight. While the mean MPV value of both groups was similar, the mean BMI value of WLG was higher than CG. At the end of the study, the mean BMI value of both groups was similar due to weight loss in WLG. Yet, the mean MPV value of WLG was lower than the mean MPV value of CG. Even if the mean BMI was similar, the likely reason of declining in MPV could be the decrease in lipid level of WLG. These findings suggest that MPV, which is an atherosclerotic marker in obese individuals, are more affected from lipid changes than weight loss.

There is no consensus about the use of NLR as a marker similar to MPV. NLR is an indicator of systemic inflammation, and there exists several studies asserting that it provides survey estimation after coronary intervention (22) and coronary artery bypass grafting operations (14). In the study conducted by Ryder et al., they found that NLR was not a useful marker in obese individuals (23). When Agacayak et al examined NLR in obese individuals with polycystic ovary syndrome (PCO), and obese individuals without PCO, they discovered that NLR was higher in obese individuals with PCO and they stated that high NLR might be a contributor in the formation of cardiovascular disease in individuals with PCO (24).

Bahadır et al claimed that NLR was lower in individuals who had a low BMI level than individuals who had a high BMI level. But it was not statistically significant (25). Additionally, in that study, it was reported that NLR , itself, could not be a reliable marker of inflammation, and did not differ according to the degree of obesity (25). Similar to that study, we found that there was no difference between the initial NLR value and the value after weight loss and NLR was not affected by BMI.

The present study had several limitations. First, design of the study is retrospective study. Obese individuals with no chronic diseases can investigate with prospective studies in the future. Second, our findings are based only on the Turkish population; different results might be observed in other ethnic groups.

## Conclusion

As a conclusion even if obesity continues after at least 5% weight loss, MPV levels reduce. The changes in MPV values are profoundly affected by the changes of lipid values.

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**Conflict of Interest:** The authors declare that they have no competing interest.

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# An early breathing disorder in a newborn: Jeune syndrome

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## Abstract

**Introduction:** Jeune syndrome affects an estimated 1 in 100.000 to 130.000 people. The syndrome causes breathing disorders accompanying upper and lower respiratory tract infections in consequence of a respectively small and narrow thoracic cage instead of the normal stance.

**Case:** Here we report a male newborn with narrow thoracic cage and short limbs. Radiological evaluation of the chest radiograph showed short ribs due to congenital abnormalities. Findings in the X-Ray computed tomography were decreased antero-posterior diameter of chest cavity accompanying short-rib dysplasia and respectively shallow acetabular cavity. Abdominal ultrasonography was also made and findings were small kidneys in bilateral stance accompanied by pelvicaliectasis and milimetric intraparenchymal liver calcification. Following the recurrent lower respiratory tract infections, the baby expired within fourth month. The final diagnosis was Jeune syndrome.

**Conclusion:** Jeune syndrome is a rare seen congenital anomaly. Radiological evaluation is essential for diagnosis. Characteristic finding include many skeletal abnormalities on costochondral junctions, clavicles, iliac bones, long bones of the extremities, and phalanges of both hands and feet. About %60 to %70 of children with this condition die from respiratory failure since they are at greater risk. Early detection is key for decreasing the incidence of death from this syndrome.

**Keywords:** Jeune syndrome, short-rib dysplasia, newborn

## Introduction

Jeune syndrome (asphyxiating thoracic dystrophy) was first reported in 1955 by Jeune et al (1).

Respiratory distress is caused by the dystrophic narrow thorax that restricts the growth and expansion of the lungs. Other accompanying anomalies can be short or cone shaped bones and extra fingers or toes (polydactyly).

Newborns may develop liver diseases, fluid-filled sacs (cysts) in pancreas and retinal dystrophy that causes vision loss. They may live only into infancy or early childhood, whereas those with mild chest bone dysplasia may live into adolescence or adulthood.

It is also possible for life-threatening kidney abnormalities, heart defects and subglottic stenosis to arise after infancy

## Case

Our case is the second child of mother married to her cousin at 19 years of age. Labor was spontaneous on 29 week 6/7 day of gestational period.

Male infant was 1204 g with abnormally short extremities. He was transferred to the newborn intensive care unit due to the serious respiratory distress. Physical examination showed abnormal narrow thorax in addition to short extremities. The Jeune syndrome was considered for the differential diagnosis. The baby was put on continuous positive airway pressure and surfactant was given through an endotracheal tube for once. Radiological evaluation of chest radiograph showed short ribs with wide spectrum of abnormalities. In X-Ray computed tomography was shown decreased anterio-posterior diameter of chest cavity accompanying short-rib dysplasia and shallow acetabular cavity (Figure 1).

During echocardiogram session a thin patent ductus arteriosus was seen. Abdomen ultrasonography detected bilateral small kidneys accompanied by left pelvi-caliectasis (Figure 2) and millimetric intra-parenchymal liver calcification. Following the recurrent lower respiratory tract infections, the baby expired within fourth month.

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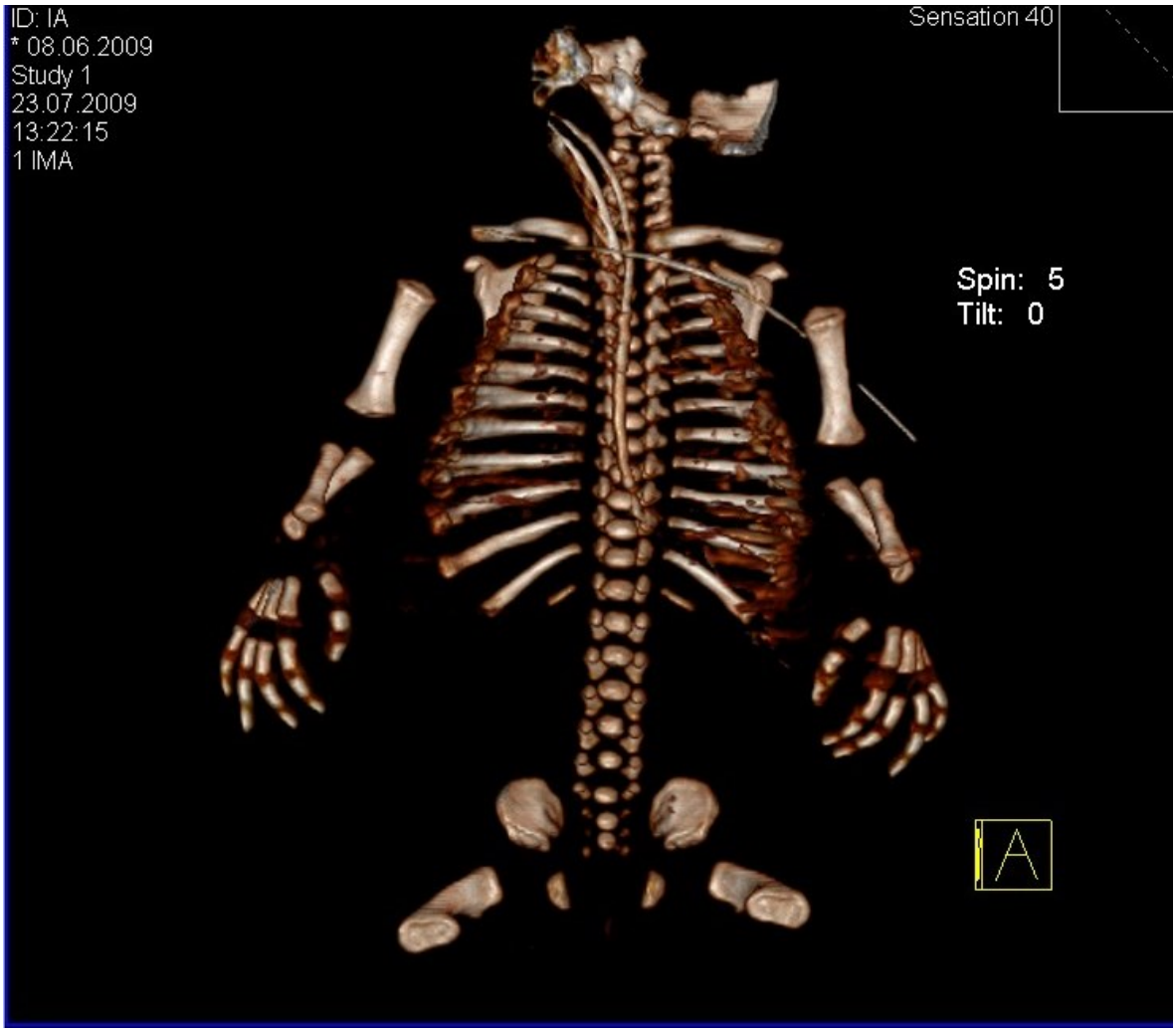


**Figure 1**. Decreased antero-posterior diameter of chest cavity and shallow acetabular cavity on 3D CT

**Figure 2**. Left pelvi-caliectasis

## Discussion

Jeune syndrome has autosomal recessive inheritance and transmitted on the short arm of 12th chromosome (3). The prevalence of Jeune's syndrome is 1 in 100.000 to 130.000. Radiological evaluation is essential for diagnosis. Characteristic findings include a narrow, bell-shaped thorax with short ribs and irregular bulbous costochondral junctions. Typical radiographic findings include a narrow bell-shaped thorax with short horizontally oriented ribs with irregular costochondral junctions, elevated clavicles, short iliac bones with a typical trident appearance of the acetabula, relatively short and wide long bones of the extremities and hypo-plastic phalanges of both hands and feet with cone-shaped epiphyses (5-10).

Costachondral irregularity which is similar to rachitic rosary is caused by irregular endochondral osteogenesis. Unusual pelvic bones are small and hypo-plastic (3,5). Horizontal diameter of iliac bones are short and acetabular angle is narrow (trident acetabulum). Epiphysis of femur heads can show early ossification. Vertebra and skull bones are not effected (6).

29 weeks-old male premature baby with his short extremities was diagnosed as achondroplasia on his first impression. Later it was for narrow bell shaped thorax and short extremities becoming a reason for the certain diagnosis of the Jeune syndrome in subsequent to first impression. In the consequence of the observation process mother was not followed up effectually during pregnancy. In theory, it also indicates that 40-50% of Jeune syndrome was diagnosed within the first month after delivery ( 4, 5).

Generally newborns with the Jeune syndrome face respiratory failure resulting death. However there are some reported cases without any respiratory involvement (11). In most of the cases the survival of the diagnosed patient depends on thorax dystrophy.

Our case suffered from recurrent respiratory infections and died on the 15th week after his birth. Hypoplastic ribs and narrow thoracic cage result in nonexpansible lungs. Autopsy specimen made clear of disturbed pulmoner vascular structure and pulmonary hypertension. It was shown that bronchial and alveolar structures were not affected (12).

Children with this syndrome may encounter renal dysplasia (6). Mortality depends on cystic changes and diffuses interstitial fibrosis (13-17). Abdominal USG examination of our case reported bilateral small kidneys and pelvi-caliectasis of left kidney.

Laboratory measurements of urea and creatinine were in the normal limits.

In our case we mentioned a millimetric intra-parenchymal liver calcification. In literature liver involvement had been reported (17). Liver involvement may progress to cirrhosis (13). According to this information blood levels of transaminase and gamma glutamyl transferase were taken into account (17). Transaminase levels were normal. The most common histopathological anomaly seen with liver involvement is portal fibrosis and bile canaliculus proliferation (2). Sonography didn't detect any abnormality of portal structures. Pancreatic cysts and exocrine insufficiency are very rare (2). We didn't observe either.

In differential diagnosis of Jeune syndrome there are chondroectodermal dysplasia (Ellis-van Creveld syndrome) and thoraco-laryngo-pelvic dysplasia (Barnes syndrome). All of the cases of Ellis-van Creveld syndrome are accompanied by polydactyl and ectodermal dysplasia (18). Our case didn't have both features. Barnes syndrome includes bell shaped thorax and laryngeal stenosis together (19). In our case there was no laryngeal stenosis.

Jeune syndrome is a rare congenital abnormality and differential diagnosis is difficult due to its characteristic features. In most of the cases the mortality is as a result of respiratory failure. Therefore early diagnosis to decrease mortality depends on doctor's recognising the concerned symptoms.

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# Late Presentation of Pericarditis After Honey Bee Sting: Case report

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## Abstract

Honey bees are members of the hymenopteran family. The sting of honey bees venom can cause a range of effects from irritation to severe form of anaphylactic shock. Anaphylactic shock occurring after honey bee sting is reported in literature for about 5% of cases. Pericarditis occurring due to honey bee sting is a rare complication, which was previously not reported. We reported a case of pericarditis following a honeybee sting with late clinical manifestations. In our case, ECG demonstrated pericarditis at the third day of hospitalization as a late complication

**Key words:** Anaphylactic shock, honey bee sting, pericarditis, late presentation

## Introduction

Honey bee sting complications can range from abdominal pain, vomiting-nausea, headache, anxiety, itching, palpitations, and high blood pressure to severe form of anaphylactic shock. Anaphylactic shock occurring after honey bee sting is reported in literature for about 4.4-6.4 % of cases (1,2). Pericarditis occurring due to honey bee sting is a rare complication, which was previously not reported. Kounis syndrome, myocardial infarction and myocarditis induced by allergic hypersensitivity and anaphylactoid reactions, was described in the literature. We reported a case of pericarditis following a honeybee sting with late clinical manifestations

## Case Presentation

A 48-year-old woman was admitted to our hospital thirty minutes later after being stung. Her past medical history included only hypertension. The patient exhibited a mild drowsy mental state with urticarial rash in the neck and upper abdominal region. In the emergency room, periorbital and perioral edema subsequently developed. She became agitated, tachypneic with stridor, desaturated (SaO2: 72% on oxygen mask) and hypotensive (Blood pressure was 80/50mmHg) with moist extremities. After intravenous adrenaline (2mg), intravenous steroids (Hydrocortisone 100mg), antihistamines (Chlorpheniramine 10mg) and intravenous fluids were immediately given; she was intubated and subsequently transferred to the intensive care unit.

Her vital signs became more stable after an hour (blood pressure, 120/75 mmHg; heart rate, 98 bpm; SpO2: 98%). At the first day of hospitalization, electrocardiography (ECG) and high sensitivity troponin assays did not demonstrate any evidence of myocardial injury. On second day the patient was extubated.

Third day of hospitalization she complained of pleuritic substernal chest heaviness, and dyspnea. The laboratory results were as follows: leukocytes 14000 (normal range: 4–10×103), CRP (C-reaktif protein): 32mg/L (normal value: 0–8), CK (Creatine Kinase): 140 (normal value: 55–170 u/L), CK-MB: 3 (< 5ng/ml) with mild elevation in the troponin I: 0.024 (< 0.014 ng/ml).

The other laboratory results were normal. ECG (Electrocardiography) showed significant ST-segment elevation in all leads except avr compatible with pericarditis (Figure 1). ECG showed normal left ventricular systolic and diastolic functions with no pericardial effusion.

At the second day of colchicine and ibuprofen treatment her complaints significantly decreased. The cardiac enzymes were returned to the normal values and the control echocardiography showed normal findings on the sixth day. The patient was discharged with ibuprofen and colchicine treatment.

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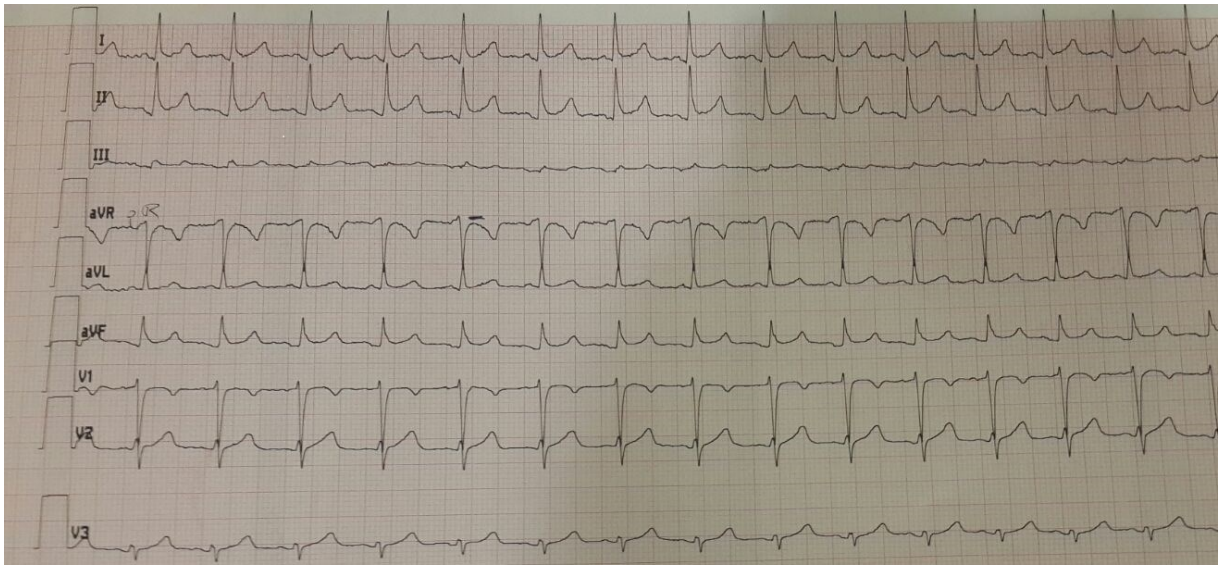

Figure 1: Electrocardiography of patient

## Discussion

Honey bees are members of the hymenopteran family. The honey bee sting can cause a range of side effects from irritation to severe form of anaphylactic shock (3). Multi organ failures, rhabdomyolysis, electrocardiographic changes, acute kidney injury and myocardial infarction are well known complications (4,5). Several cases of myocarditis and Kounis syndrome occurring after the honey bee sting have been reported. Type I Kounis syndrome includes patients with normal coronary arteries caused by acute release of inflammatory mediators during the allergic reaction (6). Epinephrine, dopamine and thromboxanes in honey bee venom can cause severe platelet aggregation, direct vasoconstriction and myocardial damage or dysfunction (7). Hypersensitivity myocarditis is diagnosed in the presence of eosinophils, atypical lymphocytes, and giant cells in myocardial biopsy, whereas biopsy in Kounis syndrome is typically normal (6). Late gadolinium enhancement in magnetic resonance imagination is highly specific for diagnosing of Kounis syndrome and myocarditis (8).

In our case, ECG demonstrated pericarditis at the third day of hospitalization as a late complication. Direct toxin effect on pericardial damage and inflammatory response secondary to allergenic effect of toxin may have an additional role in pericarditis mechanism.

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# A Case of Crohn's Disease Admitted with Acute Abdomen

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## Abstract

Crohn's disease is an inflammatory disorder and may affect any part of gastrointestinal tract. The signs and symptoms of Crohn's disease are similar to many other abdominal disorders. Crohn's disease does not typically present as an acute abdomen. However, Crohn's disease should be considered in the differential diagnosis of patients with abdominal pain, especially relevant to patients with a long history of vague abdominal complaints and those with unexplained weight loss or growth retardation. In this case report, we present such a patient of acute abdomen admitted to us after appendectomy and diagnosed Crohn's disease finally.

**Key words:** Crohn's disease; abdomen; child

## Introduction

Crohn's disease (CD) is a disorder that can involve the whole gastrointestinal system (GIS) and that can show diversified clinical symptoms (1). Therefore, it may be difficult to make differential diagnosis in case of CD. Concerning the classical CD, typical story, right lower quadrant tenderness or mass, characteristic radiographic symptoms may ease diagnosis (2). For CD patients who do not come with classical symptoms, acute abdominal symptoms may lead to confusion in diagnosis and to unnecessary surgical interventions. In this report, we present the case of a 17-year old male patient who came with acute abdominal clinic and appendectomy was applied, but when the symptoms did not regress, he was considered and diagnosed to have CD.

## Case Presentation

The seventeen year-old male patient reportedly applied to emergency service for having abdominal pain for the last two weeks that was more explicit in the abdominal right lower quadrant and epigastric region. The patient was evaluated by the department of general surgery and mesentery lymphadenitis was detected; as the abdominal pain lessened in the follow-up, the patient was discharged with ciprofloxacin and ornidazole treatment. One week later he applied to the emergency service again with the increase in abdominal pain. In the physical examination; weight: 46.8 kg (<3p), length: 164 cm (3-10p); the patient had epigastric region and abdominal right lower quadrant tenderness and rebound, and was hospitalized by the department of general surgery.

In the abdominal ultrasonography (USG) free fluid around of cecum was detected and the patient was followed on suspicion of perforated appendicitis. Computerized tomography (CT) of the abdomen revealed wall thickening in the part descending to duodenum and indicated duodenitis. The patient was operated by the department of general surgery, duodenum perforation was not detected and appendectomy was applied. The abdominal pain repeated 10 days after application of appendectomy and following his application to general surgery, he was directed to pediatric gastroenterology. When the patient applied to us, his physical examination showed that he had prevalent abdominal pain more explicit in both of the lower quadrants and he lost 5 kilos in one month. In the repeated CT, mucosal thickening was seen in the terminal ileum, intermittent wall thickening was seen in the jejunum and ileum, and free fluid in pelvis (Figure 1). White blood cell count of the patient: 13700 /Ul, hemoglobin: 13,7g/dl, platelet count: 576000 /Ul, aspartate aminotransferase: 17 U/L, alanine aminotransferase: 25 U/L, total protein: 7 g/dL, albumin: 4 g/dl, C-reactive protein: 2,3 mg/dl (normal: 0-0,5 mg/dl), erythrocyte sedimentation rate: 46 mm/s, vitamin B12: 230 pg/mL, ferritin: 176 ng/mL, folic acid: 18 ng/mL, ANCA: negative. In the upper GIS endoscopy, apparent aphthous and convoluted ulcer, fragile and granular mucosa was observed in the duodenum second part and there were also regions where usual mucosa could be observed (Figure 2).

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The colonoscopy of the patient revealed partly faintness in mucosa, nodularity and granular pattern in the colon and there were skin tag and haemorrhoidal formations in the anal region.


**Figure 1.** Increase in wall thickness of the patient in jejunum and ileum presented by abdomen CT.

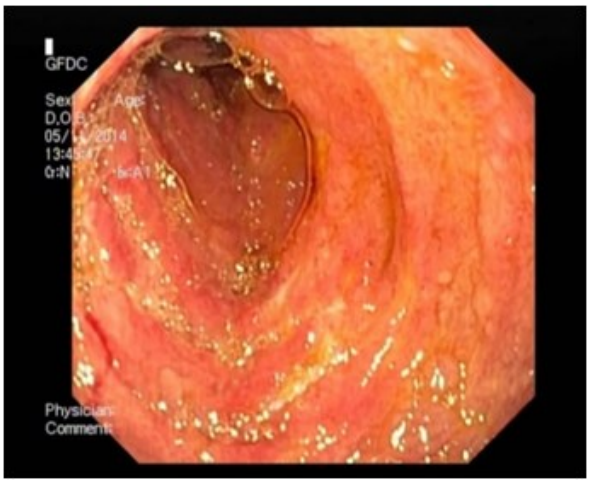


**Figure 2.** Apparent aphthous and convoluted ulcers, fragile and granular mucosa in the second part of duodenum as presented by the upper GIS endoscopy.

The patient was reported to have edematous colon mucosa with the result of colonoscopic histopathology and as a result of the upper GIS endoscopy pathology edema was seen in the lamina propria of duodenum, little number of leukocyte with polymorphic nuclei infiltration and the findings were evaluated non-specifically. The patient's abdominal pain continued and he was reported to have normal appendix vermiformis as the pathology result of appendectomy material, and together with the clinic and laboratory symptoms he was considered to have CD. The patient started to receive methylprednisolone and mesalamin treatment and he was supported by enteral feeding. The clinical symptoms of the patient regressed and azathioprine treatment was added and the steroid treatment was gradually cut down and terminated. The patient put on weight in the follow-up and his complaints did not repeat.

## Discussion

CD is a chronic, recurrent, inflammatory disorder characterized by transmural inflammation that may affect any part of the GIS, mostly involving ileum and colon (1). The clinical symptoms of the CD varies greatly according to its location and severity of the disease and may be confused with the symptoms of many abdomen based diseases such as tuberculosis, ulcerative colitis and irritable bowel disorder. Although there are many examinations used for diagnosis of CD, there is no gold standard method for establishing a differential diagnosis (2). Therefore, diagnosis of CD to differ it from other diseases is difficult. While non-caseating granuloma indicates CD, its non-existence does not exclude the diagnosis. There is no histopathological symptom specific to CD and the symptoms detected can also be seen in other disorders. The CD diagnosis is given when the story and the physical examination symptoms are supported by detectable laboratory, radiological, serologic or pathological data (3). The duodenal lesions in the upper GIS endoscopy, colonoscopy findings, wall thickening at jejunum, ileum and terminal ileum revealed by abdominal CT, loss of weight, height percentile retardation and the highness of acute phase reactants in our patient led to consideration of diagnosis of CD and the patient gave response to the medical treatment.

The antibiotics treatment that the surgery department gave at the initial application of our patient might have provided a temporary relief. In perforated appendicitis, especially as the disorder prolongs, the standard method of appendectomy is inadequate in preventing the development of complications such as intestinal fistule, peritonitis, intraabdominal abscess and acute intestinal obstruction (4). In the recurrent application of the patient, he received diagnosis of urgent surgical indication probably with the consideration that the patient had right lower quadrant tenderness, rebound and the USG was interpreted as perforated appendicitis.

Concerning the distinctive diagnosis of abdominal pain, CD should be considered especially for those patients who have long term indeterminate abdominal complaints, loss of weight and growth retardation. Abdominal pain may accompany CD, but typically acute abdominal symptoms are not frequent. For this reason, patients who come with acute abdominal

symptoms and other symptoms that may recall CD are soft, may receive late diagnosis in the aftermath of many examinations and unnecessary surgical interventions (3,5). As is the case for our patient, loss of weight, height percentile retardation, together with the story and physical examination are cautionary with regards to chronic diseases and especially for children, these features should lead to consideration of further examination before surgery.

There is the case of a fourteen-year old male patient in the literature who, following recurrent application to emergency service due to abdominal pain and vomiting, was considered to have perforated appendicitis. After he received resection for reasons of dilatation, increase in thickness and mass image in distal ileum in laparotomy, he received the diagnosis of CD (5). For patients who apply with CD complications such as stricture, obstruction and perforation in GIS in the first diagnosis, acute abdomen symptoms can be observed and the diagnosis can be made with difficulty. The literature includes cases of patients who apply with acute abdomen symptoms and considered as intestinal obstruction after application, and following surgery, terminal ileum involvement is in the foreground and the patients receive CD diagnosis histopathologically (6). It was seen that acute abdomen symptoms in our patient were not related with CD complications, and perforation, fistule, stricture was not detected, and the symptoms lessened with medical treatment. The abdomen pain of the patient was connected to small bowel involvement.

Inflammatory disorders of the right lower quadrant can mimic CD. There is also a case who had recurrent abdominal pain and was taken under treatment for having CD and whose abdominal pain repeated while under treatment and consequently received diagnosis of chronic non-granulomatous appendicitis in the literature (7). Therefore, as in this case, appendicitis can receive a wrong CD diagnosis and CD may cause confusion in diagnosis including appendix or can be seen only with appendix involvement (8).

In 0.5-4% of CD patients, duodenum involvement is observed (9,10). In our patient the lesions could be seen in in the second part of duodenum with the upper GIS endoscopy and this helped in diagnosing CD. The patients having duodenal involvement very rarely have duodenal stricture requiring surgical treatment (10).

Therefore, the follow-up of our patient is important with regards to long term complications.

Consequently, because CD can involve many parts of the GIS and because its symptoms can be confused with many other disorders the diagnosis of CD becomes difficult. Especially for patients, like our patient, who have acute abdomen like recurrent abdominal pain, CD should definitely be taken into account in the definitive diagnosis.

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# An unusual reason of abdominal pain: Rapunzel syndrome case report and literature review

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## Abstract

Bezoar is defined as a mass formed as a consequence of the accumulation of indigestible foreign substances within the gastric outlet or small bowels with resultant dysfunctional gastric emptying Gastric bezoar extending into the small or large bowel and causing a clinical condition called Rapunzel syndrome This rare pediatric condition is observed in young girls with psychiatric problems such as trichotilomania, who frequently feel an irresistable desire to pluck out, and swallow their hairs. A 12-year-old girl was admitted to our hospital with complaints of abdominal pain, growth retardation, and partial hair loss. Endoscopic examination revealed the presence of gastroduodenale trichobezoar, and her giant trichobezoar was extracted using conventional laparotomy, and anterior gastrostomy. With this case representation we reported a case with Rapunzel Syndrome in the light of literature data.

**Key words:** Unusual abdominal pain, gastroduodenal trichobezoar, trichotillomania, abdominal mass, growth retardation, laparotomy, child

## Introduction

Bezoars are defined as masses formed by indigestible materials which aggregate, solidify in the stomach and bowels of humans after the oral intake. Bezoar is a word derived from Persian (Persian pad-zahr, from pad ) which means antidote. In the literature, formation of bezoars from drugs, sand particles, chewing gum, mushrooms, antacids, sponge, and sunflower seeds have been reported (1,2). They are classified based on the content. For instance, continuous intake of plastic material (plastobezoar), antacid-like drugs (pharmobezoar), vegetable, and fruit -based materials (phytobezoar), milk and milk products (lactobezoar) and plucked hairs (trichobezoar) cause development of various kinds of bezoars indicated in the brackets.

Trichobezoar is a rarely encountered condition emerging with symptoms and signs generally involving the gastrointestinal system. Human hair can easily accumulate between gastric mucosal folds because of its smooth surface. Ingested food particles and gastric mucus together with human hair can form a trichobezoar (2). Trichobezoars can be localized only in the stomach or they can extend into pylorus, duodenum, jejunum, and colon.

Fragments broken from the terminal part of the trichobezoar which is localized in the proximal part of the stomach or small bowel can cause intestinal obstruction termed as Rapunzel syndrome. (2).

It was firstly reported in the literature in 1779 as an autopsy finding in a patient who died due to peritonitis development as a consequence of gastric perforation. This clinical condition was named after a 12 –year-old, long-haired fairy tale character Rapunzel.The first use of the term was recorded in 1968 by Vaughan et al. to define a case with trichobezoar (3-6). Since it manifests itself with nonspecific symptoms of intra-abdominal mass, abdominal pain, weight loss, nausea and vomiting, constipation or diarrhea. This syndrome generally cannot be diagnosed at its early stage. Most of the time, underlying mental or psychiatric diseases accompany this condition (2).

Cases of mucosal ulcer, and perforation, protein-energy malnutrition, obstructive jaundice, pancreatitis and death related to trichobezoar have been reported (2). Even though laparoscopic and endoscopic methods have been used in the treatment, most of the time, because of the presence of bulky masses, conventional laparotomy has been preferred (2,3). In this case, report diagnosis and treatment approach in a female child with rarely encountered Rapunzel syndrome has been reported in the light of the literature.

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## Case

A 12-year-old girl was referred to the outpatient clinics of Pediatric Surgery of Cengiz Gokcek Obstetrics and Children's Hospital with complaints of growth retardation persisting for nearly a year. It was determined from patient's anamnesis that her abdominal pain was of colicky type and localized on the epigastric region. She had not had any known disease or undergone surgery previously. Her family history revealed that she had lost her parents at an early age and brought up by her second-degree relatives. On physical examination, her general health state was in good condition. She was 136 cm (< 3 %) tall, and weighed 30.5 kg (<3 %). She had partial alopecia. On abdominal palpitation, a solid, mobile mass with irregular contours was detected over epigastric region. Laboratory tests did not reveal any pathology apart from iron deficiency- anaemia. Standing, plain abdominal radiograms demonstrated an opacity localized in the left upper abdominal quadrant. Accordingly, on EGD examinations performed, a giant mass completely filling the stomach and extending into the duodenum was detected. On abdominal CT, over distended stomach, and an image extending from the gastric lumen into duodenum which suggested the presence of a foreign body was observed. Esophagogastroduodenoscopy, the fixed mass extending from gastric cardia into duodenum, which did not allow passage of the endoscope was evaluated as trichobezoar. Since the mass was very bulky, which was not amenable to endoscopic extraction, and its surface was too hard to be fragmented with a biopsy forceps through supraumbilical midline laparotomy incision exploratory surgery was started. Anterior gastrostomy incision was performed on gastric body, and a trichobezoar which completely filled the stomach which then extended into the second part of the duodenum, and took its shape was extracted (Figures 1, and 2).

Figure 1: Anterior gastrotomy incision on the gastric body

Figure 2: Trichobezoar which took the shape of the stomach, and the duodenum

In the histopathological examination, a hairball which contained food residues and took the shape of the stomach measuring 32x11cm and weighing 1.8 kg was detected. The patient did not experience any complications during the postoperative period, therefore she was discharged on the 7th postsurgery day. The pediatric psychiatry detected obsessive-compulsive disorder and trichotillomania (impulsive hair plucking) with recommendation of ambulatory controls. Enlightened consent form was obtained from the patient

## Discussion

Trichobezoar is a type of bezoar which can generate unusual, abdominal pain in childhood and adolescence. Since the mass grows slowly and yields nonspecific symptoms, it generally remains concealed for a long time. Symptoms like abdominal pain, nausea, vomiting, weakness, growth retardation, alopecia, history of psychiatric disease, nutritional, and vitamin deficiencies, iron deficiency anemia, palpable epigastric mass (Lamerton sign), detection of hair strands in stool in addition to radiological findings aid in the diagnosis of trichobezoars (2). In our case, colicky abdominal pain, growth retardation, and partial alopecia were found. Especially contrast-enhanced radiograms can be helpful in the differential diagnosis of the masses localized in the upper gastrointestinal system. Endoscopy is known to have the highest sensitivity and specificity because it provides information about the structure of the mass. On ultrasonograms, they can be seen as a wide hyperechoeic band localized in the stomach, and bowels. CT examination can yield information about the location, and distribution characteristics of the bezoar. In our case, even if a mass lesion was detected in EGD examinations and abdominal CT, the diagnosis could not be confirmed till GIS endoscopy was applied. In the literature, it has been indicated that a case of trichobezoar which cannot be detected in the

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short-term can cause ileus, perforation, ulceration, bleeding, pancreatitis, obstructive jaundice, superior mesenteric artery syndrome, invagination, peritonitis or even death (3).

Continuous intake of indigestible materials is mostly held responsible from development of trichobezoar (2). The etiological factos include psychiatric problems including underlying depression, anxiety, obsessive compulsive disorder, emoıtional factors such as stress, problematic family environment, loss of mother and/or father or mental retardation. Our patient had lost her parents. Generally, the underlying cause of trichobezoars is an impulse control disorder named trichotillomania. Trichotillomania which was firstly described in 1889, is a condition of partial alopecia (partial baldness), mainly caused by impulsive hair pluckings. Patchy areas of baldness were also detected in our case. Some authors have also reported that these patients had felt a desire even to eat their eye brows, eyelashes, arm, leg, and pubic hair. The incidence of trichotillomania ranges between 0.6, and 1.6 %, and in 30 % of these patients.

Although trichobezoars are known to be most prevalent in the age of 13-20 years, a 54-year-old case has been reported in the literature. They are most frequently localized in the stomach and take the shape of this organ in the long-term. Their migration from the stomach into the small bowel may cause obstructive jaundice, pancreatitis, protein-loss enteropathy (7). Giant trichobezoars develops only in one percent of the cases. Our case was quiet a large trichobezoar in a small girl. In “Rapunzel syndrome,” the terminal end of trichobezoar localized in the stomach extends towards small bowel. This condition is a very rarely seen form of trichobezoar, and more than 90 % of the cases consist of girls younger than 20 years of age (2,4). In our case, a trichobezoar completely filling the stomach of a 12-year-old girl, and extending into the duodenum was observed.

Phytobezoar is the most prevalent type of bezoar which is usually encountered in adult patients secondary to gastric motility, and consequently decrease in gastric acid levels. Risk factors for the development of phytobezoar include history of gastric surgery like vagotomy, pyloroplasty, Billroth II and gastroenterostomy. In the pathogenesis of phytobezoar formation in these patients include decrease in truncal gastric acidity and delayed gastric emptying. More rarely, it can be seen in cystic fibrosis patients who had lung transplantation or following cholecystectomies (2). However, lactobezoars can develop during neonatal period secondary to use of concentrated baby formulas for premature infants.

The objectives of the treatment include extraction of the mass as a whole and prevention of recurrences. Very small bezoars at the time of diagnosis can be thrown out naturally through gastrointestinal route by using a liquid diet and prokinetic drugs (2). In the endoscopic treatment, bezoar mass is fragmented into small pieces using biopsy forceps before the extraction. Success rates of this method ranges between 85-90 percent (2). Use of extracorporal shock waves or Nd-YAG laser for the fragmentation of the bezoar is already acknowledged (2,8). Apart from endoscopic fragmentation, application of intragastric enzymes (cellulose, lipase, and N-acetylcysteine) enables disintegration of bezoars (8). Phytobezoars and lactobeozoars are relatively small and can easily be broken into pieces, so endoscopic treatment is effective in their fragmentation. However, in trichobezoars the success rates of endoscopic treatments are not so great.

Since hairs contained in trichobezoars are resistant to mechanical fragmentation or enzymatic disintegration, generally surgical treatment is preferred instead of endoscopic interventions. Besides, emergence of complications caused by bezoars creates an indication for surgical interventions (9). In this case, open or laparoscopic surgery can be used. In the laparoscopic method, broken fragments of trichobezoars can cause intestinal occlusion and hair strands falling into the peritoneal space may result in complications. In the Rapunzel syndrome, currently open surgery and anterior gastrotomy are recommended so as to extract giant gastric bezoars (8). Success rate of 99 % has been reported for conventional surgery (3). In this case, we made a diagnosis of trichobezoar based on endoscopic examination, and then we performed conventional laparotomy. Bezoar can sometimes simultaneously occur in more than one foci, so complete gastrointestinal system exploration should be made. In our patient, since the hair ball was very bulky we extracted it with open surgery and complete intestinal exploration was performed. Some authors reported development of recurrences following surgical interventions (3,10). During our two years of follow-up, we haven’t encountered recurrences related to the presence of bezoar.

Trichobezoar is an important condition which should be treated before the development of complications. Therefore, in young girls complaining of abdominal pain and abdominal mass who have psychiatric diseases accompanied with habits of hair plucking (trichotillomania) in addition of trichophagia (eating hairs) possibility of trichobezoar should be contemplated. In its treatment, still conventional laparotomy is used prevalently. Besides, as an important issue, young girls with trichobezoars should be also followed up by pediatric psychiatry in order to prevent development of recurrences.

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