

SYSTEMIC COMPLICATIONS AND THEIR RISK FACTORS AMONG TEHRANIAN BLOOD DONOR, 2005

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Abstract- The systemic complications of blood donation are the first reasons why patients fail to return for further blood donation. This study was designed to determine the frequency of these complications and their associated risk factors among blood donors in Tehran. Also, we aimed to provide suitable methods to decrease the frequency of these adverse events, thereby eliminating the most important causes of withdrawal, while maintaining the health of the donors. This analytical descriptive cross-sectional study was performed on 554 blood donors who had donated blood from February 2005 through September 2005 in four fixed blood donation bases and four mobile blood collection buses. Each base was considered as a stratum, and a stratified random sampling proportional to size was done to select the donors. Results showed donor reaction rate to be 13.4%, the most common of which were blackout of vision (7%), dizziness (6.3%), fatigue (6.1%) and nausea (1.8%). There was no significant relationship between the incidence of these complications and type of base blood donation or fasting at the time of blood donation. Logistic Regression analysis showed that sex, condition of blood donor, exercise or walking, duration of donation, and practice to recommendation had significant effects on the odds ratio of systemic complication. Regarding the frequency values derived for the different systemic complications it can be concluded that attention to risk factors of these complications and their control can help encourage donors to become repeated donors as well as to prevent their withdrawal for further blood donation.

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INTRODUCTION

One of the most important goals of the Iranian Blood Transfusion Organization is to provide adequate amounts of healthy blood. Since one of the best sources of healthy blood are repeated volunteer

donors, an important part of donor care is to identify the complications associated with blood donation. The most important factors which decrease the desire of volunteers for further blood donation are the adverse events they experience after donating blood, which impedes provision of adequate healthy blood (1-4). A study in 2003 showed the most common adverse events were fatigue, vasovagal reactions, and nausea and vomiting. Complications were two-fold more common in women compared to men. Repeated donors experienced fewer complications than first-time donors (5).

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Systemic complications of blood donation

There was a clear relationship between fainting and amount of blood withdrawn from the donor (6). In another study factors such as age, body weight and donor condition were found to have relationship with syncope. On the other hand, sex, blood pressure and pulse rate prior to blood donation did not increase the rate of complications (7).

The aim of this study was to determine the frequency of systemic complications of blood donation and some associated risk factors and to provide suitable methods to decrease the frequency of these adverse events, thereby eliminating the most important causes of withdrawal, while maintaining the health of the donors.

MATERIALS AND METHODS

This descriptive analytical cross-sectional study was performed on 554 volunteers who had donated blood from February 2005 through September 2005 in the 4 fixed blood donation bases and 4 mobile blood collection buses. Sample collection was done by stratified random sampling in proportion with the load of attendees to the bases. Stratification was based on fixed or mobile blood donation bases. Entrance criteria included: Desire to participate in the study, residence or occupation inside Tehran, possibility of follow-up, insertion of the needle into the patient's skin whether it was associated with complete or incomplete blood withdrawal.

Data collection took place by a questionnaire comprising of two parts; the first part was completed at the blood donation base at the time of blood withdrawal and was based on the information recorded in the donor sheet form, direct observation

by the researcher. The researcher did not interfere with the process of blood donation in any way and only acted as a neutral observer in the steps of blood withdrawal, observed each step, made sure the standards were kept, and recorded any probable complications. According to existing sources 6% of early complications occurred within three days of blood donation. The second part of the questionnaire was completed after five days in the form of a post-donation interview at the donor's residence or place of work. Observers and interviewers were two physicians that had training course for completing of questionnaires.

After completion of data related to 554 donors, data was analyzed using SPSS version 11.5. Fisher's exact test and chi-squared test and logistic regression analysis were used to determine the relationship between the variables.

RESULTS

Among the 554 blood donors under study, 94% of blood donors were male and 6% were female. According to the donor condition, 13.2% and 32.3% of them were first-time and frequent and repeated blood donors, respectively. Since mean age and mean body weight were almost equal in both groups, they were not considered as confounding variables and excluded from statistical analysis. Mean systolic and diastolic blood pressure before and after donation were statistically different (Table 1).

Results showed that overall, 13.4% of blood donors experienced systemic complications after blood donation.

Table 1. Means and SDs of independent variables with results of *t* test and paired *t* test Tehran 2005

Variable		Mean	SD	P value
Body weight	With complication	79.28	12.41	0.31
	Without complication	82.58	12.10	
Age	With complication	34.58	10.28	0.068
	Without complication	37.01	10.69	
Systolic blood pressure	Before donation	131.6	15.33	0.0001
	After donation	118.44	14.10	
Diastolic blood pressure	Before donation	84.49	9.68	0.0001
	After donation	79.64	9.33	

Table 2. Frequency of systemic complications according to condition of blood donor among blood donors in Tehran

Condition	Systemic Complications		Sample size
	Yes	Percentage	
First time	19	26.0	73
Frequent	20	11.2	179
Continuous	35	11.6	302
Total	74	13.4	554

Blackout of vision (7%), dizziness (6.3%), fatigue (6.1%), orthostatic hypotension (2.7%), nausea (1.8%), pallor (1.4%), cold skin (1.3%), cold sweat (1.1%), fainting (0.5%), and seizures (0.2%) were seen but no cases of vomiting was reported.

The frequency of systemic complications had a significant relationship with gender, such that it was three-fold more common in females than males (36.4% vs. 11.9%; $P < 0.0001$). There was also a significant relationship between the prevalence of complications and the condition of the donor, such that the prevalence of complications was two-fold among first-time donors as compared to frequent or repeated donors (26% vs. 11.2% and 11.6% , $P = 0.003$) (Table 2). In addition, the incidence of these complications had a significant relationship with exercises or walking prior to blood donation such that it was twice as frequent among subjects who had exercised or walked for at least 1.5 hours before donating

Table 3. Professional sport among blood donors prior to donating blood

Professional Exercise	Systemic Complications		Sample size
	Yes	Percentage	
Yes	14	29.2	48
No	60	11.9	506
Total	74	13.4	554

blood (29.2% vs. 11.9%, $P = 0.0001$)(Table 3).

There was also a significant statistical relationship between prolonged duration of blood donation and systemic complications such that the rate of complications was 26.7% when blood donation took more than 10 minutes ($P = 0.4$). The prevalence of systemic complications was significantly related with failure to observe two important recommendations after blood donation, such that smoking within one hour after blood donation increased the prevalence of complications by five-fold (57.1% vs.12.8%; $P = 0.008$) and inadequate intake of fluid after blood donation, increased the complications six-fold (71.4% vs. 11.9%; $P < 0.0001$).

For evaluating the joint effects of variables, logistic regression analysis was used. All variables that had statistical relationship with systemic complications entered in regression model (Table 4).

Table 4. The result of logistic regression analysis on systemic complication outcome in blood donors Tehran (2005)

	Regression coefficient	Standard error	Odds ratio	95% CI	P value
Sex					
Female	1.31	0.42	3.72	1.64-8.44	0.002
Male	-	-	1	-	-
Condition of Blood Donor					
First	0.95	0.35	2.58	1.31- 5.08	0.006
Frequent	0.05	0.31	0.95	0.52-1.75	0.88
Continuous	-	-	1	-	-
Walking or Exercise before donation					
Yes	1.32	0.37	3.1	1.50-6.46	0.002
No	-	-	1	-	-
Duration of Donation					
	0.11	0.05	1.11	1.01-1.23	0.04
Practice to recommendation by donor					
Yes	1.20	0.33	3.33	1.76-6.32	<0.001
No	-	-	1	-	-
Constant	3.42	0.43	0.04	-	<0.001

DISCUSSION

According to our results, the frequency of donor complications was 13.4%, which is in accordance with the study performed by Corlin and Perterson (4). The most frequent systemic complications were blackout of vision (7%), dizziness (6.3%), fatigue (6.1%), and nausea (1.8%) which were similar to values reported in the study performed by Newman in 2003 (5) who reported these values to be 6.8%, 5.8%, 7.8% and 1.1%, respectively.

The frequency of fainting in our study was 0.5% which is lower (3.8%) than that reported by Poles and Boycott in 1992 (6). This finding may be due to the preparedness of Iranian donors, because in most cases fainting due to vasovagal reaction is caused by excitement, fright, or anxiety. Logistic regression analysis showed that the odds ratio of systemic complication in women was 3, 72 (CI: 1.64- 8.44) times more common compared to men. Several studies have shown that female donor have more reactions than male donors (5, 7, 10). This was thought to be due to the female donor's smaller size (8, 10). Also we found that the odds ratio was related to donor conditions, so that the odds ratio in first time donors was estimated 2.58 (CI: 1.31-5.08) compared to continuous donor. This is in agreement with the results derived from some studies (5, 7, 10, 12). It is expected for the first-time donors to be more anxious than repeat blood donors, because the procedure of blood donation is unknown to them. The stress has direct emotional effect and may affects peripheral ventricular baroreceptor sensitivity (11). Our study showed that the incidence of systemic complications resulting from blood donation has a significant relationship with walking or exercise prior to blood donation, such that the frequency of systemic complications among blood donors who had exercised for at least 1.5 hours prior to blood donation was 3.1 times more common compared to other donors. The causes of this finding is not clearly understood but fatigue, loss of body fluids due to sweating, and fall of blood glucose level due to exercise may be probable causes which ultimately lead to inadequate potential for the body to compensate for the lost blood volume. Prolonged blood withdrawal (more than ten minutes) also had a significant relationship with systemic complications

of blood donation. For one minute increase in duration of donation, %11 (CI: 1.01-1.23) increase will happen in the odds ratio of systemic complications. The pain caused by prolonged insertion of the needle in the subject's upper limb can lead to a vasovagal reaction and other systemic complications and in case the process is prolonged due to superficial vasoconstriction (collapsed veins), it can lead to cold skin, cold sweating, pallor, and mild systemic complications.

The incidence of systemic complications also has a significant relationship with failure to observe two important points, including not smoking within one hour after blood donation and more fluid consumption within the first four hours of blood donation (13). This may be due to the fact that smoking leads to changes in the pulse and lowering of blood pressure, thereby increasing the chance of developing systemic complications. It is clear that fluid intake helps in compensating for the lost blood volume and thus prevents systemic complications. Therefore, in case these two points are not observed the drop in blood pressure caused by slow volume compensation can result in systemic complications. We found no relationship between the place of blood donation and systemic complications. Considering the above findings we could conclude that the systemic complications of blood donation are mostly preventable. Therefore, in order to prevent these adverse events, while maintaining the health of the donors and in order to help encourage donors to become repeated donors the following points are suggested:

- Maintain a good relationship with the donor before blood donation so that anxiety is eliminated. Also the donor should be followed-up 24-48 hours after blood donation
- Stress on the importance of drinking fruit juice and taking some rest after donating blood especially in women and first-time donors
- Postponing blood donation for subjects who had walked a lot or exercised before blood donation
- Stressing on the importance of not smoking and ending blood collection in subjects in whom the duration of blood donation is exceeding 10 minutes.

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Conflict of interests

The authors declare that they have no competing interests.

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