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EVALUATION OF WATER CONSUMPTION AND DRINKING WATER PREFERENCES IN VARIOUS AREAS OF WORKERS WORKING IN THE CONSTRUCTION SECTOR OF TRABZON

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ABSTRACT

Introduction

The water balance of the body needs to be maintained for sustain vital activities. It is necessary to provide access to both adequate and healthy drinkable water for workers work in the construction sector needs high amount of liquid because of reasons such as intense physical activity and environmental conditions.

Aim of the study

To evaluation of water consumption, water quality considerations and drinking water preferences for construction sector workers in Trabzon.

Material and methods

It was conducted as a face-to-face questionnaire with 147 employees who can be reached in the construction area of Trabzon. The data was analyzed by IBM SPSS Statistic for Windows 23.0 software.

Results

The average daily total water consumption and the daily total liquid consumption of the participants was determined respectively as 1991.5 ± 1348.0 (500-10000) ml, 3854.7 ± 1881.1 (960-11900) ml. 82.3% of participants stated that they drink water when they are thirsty. In addition, 8.8% of the participants stated that they consumed dispenser bottled water while working.

Conclusions

It was concluded that more than half of construction workers need high liquid consumption have daily water and liquid intake is below the recommended daily liquid intake level.

Key words: construction workers, liquid consumption, water consumption, water quality

INTRODUCTION

Water is one of the most important life sources for the continuation of the physiological functions of the human body (1, 2). It is very important that compensate of lost water resulted from various physiological processes. Liquid needed to be taken daily, including drinkable water and other drinks and foods are recommended 3.7 liter for adult male and 2.7 liter for adult female (3). However, it's well known that this necessity is strongly affected by factors such as health status, physical activities and environmental conditions. For example; daily water necessity of adult male has intense physical activities reach to 4.5 liter level (4).

Construction workers can be defined as a group which has been increased daily water necessity because of some reasons such as intense physical activities and environmental conditions (5). Supplying of adequate, healthy and safe drinking and handling water to this group must be provided. (6). It is important to evaluation of the daily liquid consumption of construction workers and how to the determined this necessity to avoid health problems resulting from dehydration due to insufficient liquid intake. Determining the water sources used by construction workers in areas such as food, beverage preparation, shower and toilet needs in the working environment as well as drinking water consumption is important in determining the preferences for access to healthy and safe drinking water.

How much do construction workers get daily from which liquids and how do they determine this necessity? How do they decide the water used by them whether safe or not? Which water source do they prefer for different using areas and what do they think about the qualities of these water resources? There were very limited studies aimed to answering of these questions in Turkey.

This study was performed in Trabzon first time and aimed to evaluation of water consumption, considerations about water resources quality and drinking and handling water preferences for construction sector workers in Trabzon.

MATERIALS AND METHODS

The insured employees in the construction sector in Trabzon constitute the universe of this descriptive work. The classification prepared by the Social Security Institution (SGK) according to its business activity and area was used to determine the size of the working universe. According to this classification and 2015 data in Trabzon province of the SGK, 16939 insured employees are included in the 41 code building construction activity group. However, it can be some differences between official data and real numbers of employees worked on field due to seasonal conditions and periodic construction industry stagnation during the period of the

study (first half of December). In the other side, it can be disagreement employee numbers between calculated by taking into account registered companies and field worked. Accordingly, the survey was conducted between December 5 and 15, 2016 as a face-to-face questionnaire survey of 147 employees who could be reached in the provinces of Trabzon. Before the questionnaire form was applied, the participants were informed about the study and verbal approvals were taken.

The data collection form questions can be categorized as employee descriptive, daily water consumption and quality, cleanliness and chlorination of this water, water resources which have been used, dispenser bottled water and thinking about them.

Before data was evaluated, participants' body mass indexes were calculated by weight/height² (kg/m²) formula. On the other side, daily consumption amounts of liquid (water, tea, ayran, soda/fruit juice) in the building and at home (ml) was calculated by taken liquid units (water glass, tea cup, cardboard cup, liter) and taking periods (daily, every second days, two times a week, once every 15 days, no consumption). Additionally, daily water consumption of employee at home and work was calculated with acceptance of a cup of tea as 100 ml, a cardboard cup as 150 ml, cup of water as 250 ml.

Daily total liquid consumption of the participants was assessed as three groups. This classification was divided into according to amount of liquid to be taken daily (3.7 liter) for adult man: In first group was called as recommended level which taken water is between 10% less and 10% more than 3.7 liter (3420-4180 ml), in second group was under the recommended level 10% less than 3.7 liter (< 3420 ml), in last group was above the recommended level 10% more than 3.7 liter (> 4180 ml).

Statistical analysis

The data was analyzed by IBM SPSS Statistic for Windows 23.0 software. It was presented qualitative data with number (n) and percentage (%); measured data with mean, standard deviation (SD) and minimum-maximum values. The suitability of the normal distribution of construction workers' liquid consumption values for home and construction was examined by the Kolmogorov-Smirnov test. Wilcoxon test was used in the analysis of these data which do not accordance with normal distribution. $p < 0.05$ value was accepted as significant statistically.

RESULTS

All of the participants worked in construction sector in this survey was male whose age changed with 33.4 ± 10.1 (17-64) and working year changed with 12.9 ± 9.4 (1-40) years. 52 (35.3%) of the participants were elementary and secondary school graduates.

Average body mass indexes of participants were 24.9 ± 4.1 (18.0-55.5) kg/m², 144 (98%) of them had no chronic disease and 137 (%93.2) of them worked in the dwelling construction sector. Some descriptive characteristics of participants about working areas are presented (Table 1).

Table 1. Some descriptive attributes of participants' working areas

	n	%
Construction type		
Dwelling	137	93.2
Stream improvement	7	4.8
Concrete plant	2	1.4
Quarry	1	0.7
Working area in construction		
Wood/Panel/Tunnel pattern-maker	28	19.0
Gypsum board/Gypsum plasterer	25	17.0
Bar bender	18	12.2
Unskilled workers	13	8.8
Elevator installer	12	8.2
Ceramic tile setter	9	6.1
Mason	9	6.1
PVC/Wood joinery installer	6	4.1
Business machine operator	6	4.1
Plasterer	6	4.1
Other (painter, concrete worker, scaffolding installation staff, heat/water/fire/sound isolator)	15	10.2

The daily liquid consumption amounts (ml) of participants and the comparison of their consumption at work and home are presented (Table 2).

Table 2. Daily liquid consumption amounts of participants in construction and at home (ml)

	Amount of liquid consumption in construction (ml) Mean \pm SD (Min.-Max.)	Amount of liquid consumption at home (ml) Mean \pm SD (Min.-Max.)	p
Water consumption (ml/day)	1022.1 \pm 766.9 (0-5000)	969.4 \pm 737.2 (0-5000)	0.155
Tea consumption (ml/day)	760.5 \pm 664.8 (0-3000)	650.3 \pm 618.9 (0-3000)	0.060
Ayran consumption (ml/day)	95.3 \pm 149.6 (0-1000)	148.5 \pm 219.7 (0-1000)	0.003
Juice/soda consumption (ml/day)	82.1 \pm 180.9 (0-1250)	126.4 \pm 254.1 (0-2000)	0.017
Total liquid consumption (ml/day)	1960.1 \pm 1095.8 (12-5950)	1894.6 \pm 1054.4 (0-5950)	0.730

The average daily total water and liquid consumption of the participants was determined as respectively 1991.5 ± 1348.0 (500-10000) ml and 3854.7 ± 1881.1 (960-11900) ml. Range of participants according to their total daily liquid consumption is presented (Table 3).

Table 3. Participants' distribution by daily total liquid consumption

	n	%
Liquid consumption below the recommended daily level (less than 3420 ml)	75	51,0
Recommended daily liquid consumption level (between 3420-4180 ml)	22	15,0
Liquid consumption above the recommended daily level (more than 4180 ml)	50	34,0

121 (82.3%) of the participants stated that they drink water when they are thirsty, 74 (50.3%) of them realize the water cleanliness with taste and beside these 66 (44.9%) of them stated that chlorination of water is useful. The ideas stated by participants about determination criterions of their daily water needs, decision mechanism for water cleanliness and their thoughts on chlorination are presented (Table 4).

Table 4. Determination criterions of their daily water needs, decision mechanism for water cleanliness and thoughts about chlorination

	n	%
How do you determine your daily water needs?		
In times of thirsty	121	82,3
In times of hot/watery air	48	32,6
In the break	30	20,4
When it comes to mind	21	14,3
When it remind	2	1,4
Others	2	1,4
How do you decide the water is clean?		
With taste	74	50,3
With color	42	28,6
With smell	20	13,6
Presence of stone/stone etc. inside it	7	4,8
Can not decide	2	1,4
Others	2	1,4
What are your thoughts on the chlorination of the municipal water?		
Although bad smell is also helpful.	66	44,9
It doesn't made because of very bad smell of it.	27	18,4
It doesn't made because it is harmful to children.	10	6,8
It doesn't made because it cause cancer.	9	6,1
No idea	35	23,3

The answers to the question of which water consumption source have been used most frequently in construction for the different usage areas of participants are presented (Table 5) and the ideas regarding the quality of various water resources are presented (Table 6).

The participants' data on the use and cleaning of the dispenser bottled water in construction are presented (Table 7).

Table 5. Most frequently water consumption sources used by participants to meet their needs in various areas of construction

	Municipal water		Packaged water	
	n	%	n	%
Drinking water	120	81,7	27	18,4
Cooking	144	98,0	3	2,0
To prepare hot drinks	144	98,0	3	2,0
Washing of dishes	147	100,0	0	0,0
Toilet	147	100,0	0	0,0
Shower/bath	147	100,0	0	0,0

Table 6. Participants' thoughts on the quality of various water resources

	Very good		Good		Medium		Bad		Very bad	
	n	%	n	%	n	%	n	%	n	%
Drinking water	0	0,0	39	26,5	64	43,5	33	22,4	11	7,5
Packaged water										
Bottle	7	4,8	104	70,7	31	21,1	5	3,4	0	0,0
Dispenser bottled	3	2,0	99	63,3	44	29,9	7	4,8	0	0,0
Spring water	111	75,5	32	21,8	3	2,0	1	0,7	0	0,0
Well water	5	3,4	24	16,3	39	26,5	63	42,9	16	10,9

Table 7. Participants' thoughts on the dispenser bottled used in construction

	n	%
Dispenser bottled water usage status	13	8,8
Frequency of pump cleaning		
No cleaning	6	46,2
Randomly cleaning	2	15,4
Once in a week	3	23,1
Once every 15 days	2	15,4
How do you clean the pump?		
Only with water	3	42,9
With dishwasher	1	14,3
With boiling in water	1	14,3
Others (Washing with bleach, waiting in detergent etc.)	2	28,6

DISCUSSION

Construction employees work in intensive physical activity, variable working and external environment conditions. For this reason, they are a group that the daily needs liquid have been increasing. Furthermore, as stated in the "Regulation on Occupational Health and Safety in Construction", it is necessary to have enough drinking water and if possible, other soft drinks for the employees in the work site and shed (7). It was reported in (5) that the average total liquid consumption of employees, who work on construction sites in the United Arab Emirates, was between 5000 and 6000 ml during the 12-hour shift. However, in our study, the daily average water consumption of the employees in construction was determined as 2000 ml, which is lower than the value reported in (5). It was also found that half of construction workers had a total daily liquid consumption of less than 3700 ml, which is recommended for a person in normal metabolism. On the other hand, the water consumption of workers increasing their liquid needs due to the working conditions is much more important for the continuation of their physiological processes. Low fluid intake may result both in reduced work efficiency and may affect the health of employees negatively.

The provision of municipal water in residential areas is very important for people to access healthy and reliable water. Because of the right of the individual and the community to access healthy and reliable water, it is necessary that the municipal water is the main resource for the drinking water and the confidence of the community regarding the quality of the municipal water must be ensured (8). It might be not possible to make municipal water connection during construction due to some reasons such as being far from city center. For this reason, drinking water for workers can be supplied from water tank, well water or packed water. According to (8, 9), about one third of the participants being carried out a questionnaire with them in Trabzon (8) and in Denizli (9) prefer to use municipal water as drinking water. In our study, it was observed that more than 80% of the participants for drinking water and more than 90% of for many purposes such as cleaning, preparing food and drinks were using municipal water. The reason for this result may be the water supplied to the construction sites is the municipal water rather than which water the participants' preferred. At this point, it can be said that most of the construction sites considered in our study used municipal water. This situation is very positive in terms of employees' to access the healthy and reliable water. However, for the health of the employees, it is necessary to ensure that the construction sites are subjected to control from the supply of the municipal water to the end of the use phase and that the consumption is done in hygienic conditions. It may be useful to include this sector in the network sampling point in the observation of the public health directorates.

In our work, it was also found that construction workers consumed more water, tea, and total liquid in working area than at home. Most of the participants stated that their daily water consumption was determined by thirst situation. Participants are more likely to consume more fluid at work because they are spending their active hours at work and increasing water needs during this time due to the effort they spend.

It is very important for the drinking water to be purified from disease-causing microorganisms and to chlorinate the water in order to reach the consumers in a healthy way. When participants were asked their opinion about the chlorination of municipal water, majority of them have declared that chlorination should not be done or that they do not have any opinion on this issue. A mandatory and constantly applied chlorination process is seen as harmful by some of the participants, and having no idea some of them have about to it. Due to this, insufficient and inaccurate information about chlorination is common among the participants.

Ensuring consumer confidence with respect to water quality and supplying the suitable water for the consumer is crucial in terms of determining water consumption habits. Therefore, it is necessary for consumers to clarify the reasons underlying their perceptions of drinking water quality. In a multinational study, it was reported that the most important factors affecting water quality perception are water organoleptic properties (especially taste), risk perception related

to water and perception of chemical content (lead, chlorine, hardness) (10). It was stated in (9) that about two-thirds of those who consume the municipal water were not sure whether the municipal water was clean or not. In our study, none of the participants assessed very well the quality of the municipal water, about 75% of them are indicated that medium and lower quality. When participants are asked how they decided that the water was clean, it has been determined that half of the participants decide according to the taste, and approximately the other half decide according to the color and smell. It is noteworthy that workers do not trust the municipal water they use most often as drinking water. This makes us to think that despite the negative perceptions of the participants for municipal water, participants are still using municipal water as drinking and handling water, due to difficulties in accessing other water resources. However, the fact that participants do not have a positive opinion on the quality of water they drink is very important because it can also affect water consumption quantities. Providing suitable water for construction workers and informing the workers about this issue can increase the confidence of the water quality. Thus, they can determine the water consumption habits, and this might provide positive health outcomes.

Constraints

Our work was carried out in winter conditions in December, which is at the low temperature. This may have led to a low level of liquid consumption. Ensuring the seasonal diversity of the work can reduce drawback on the generalizability of water consumption which will vary depending on weather conditions.

CONCLUSION

It was concluded that more than half of construction workers need high liquid consumption have daily water and liquid intake is below the recommended daily liquid intake level. However, a considerable ratio of the workers is consuming liquid above to recommended daily level. Most of the workers stated that they drank water when they thirsted and sweated and nearly all of them mentioned that they preferred municipal water as a source of water consumption in different areas. Nevertheless, it was observed that a large ratio of workers has negative idea about the quality of the municipal water. Informing of this group which has a considerable amount of liquid lost and taken liquid is under the recommended level, has great importance about appropriate amount of liquid consumption and healthy sources, clean and continuously supplying of water consuming that in the working areas.

Competing Interests

All authors hereby have declared that no competing interests exist.

Authors Participations

All the authors participated in the study design and created the questionnaires. ÜB, BA, VT, and HBB participated in the data collection. YD, İD and MT performed the statistical analysis and participated in the managing of the analyses of the study. All authors wrote, read and approved all versions of the manuscript.

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