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Assessment Of Access To Healthy Water And Water Management In Schools

Okullarda Sağlıklı Suya Erişim ve Su Yönetiminin Değerlendirilmesi

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Öz

Giriş ve Amaç: Hızlı kentleşme, sanayileşme, artan nüfus ve küresel iklim değişikliği suya olan ihtiyacın artmasına neden olmakta, suyun korunması ve yönetimi önemli ve güncel tartışma konuları arasında yer almaktadır. Toplumun temel yapı taşlarından biri olan okullar gibi eğitim kurumları da su yönetimine özel önem vermelidir. Bu çalışmanın amacı, Muğla ili Menteşe ilçesindeki tüm okullarda yeterli, güvenli ve sürekli su temini, su kullanımı ve su tasarrufu konularında alınan önlemleri ve verilen eğitim faaliyetlerini araştırarak okullarda su yönetiminin durumunu belirlemek ve değerlendirmektir.

Gereç ve Yöntemler: Çalışmamız tanımlayıcı bir çalışmadır. Muğla ili Menteşe ilçesinde bulunan 78 okuldaki okul yöneticilerine yüz yüze görüşme yöntemiyle anket uygulanmıştır. Örneklem seçilmemiş ve evrenin tamamına ulaşılmıştır. Okullarda su yönetiminin mevcut durumu yeterli, güvenli ve sürekli su temini, suyun korunması ve sürdürülebilirlik kapsamında ele alınmıştır. Tanımlayıcı istatistikler sayı ve yüzde, minimum, maksimum ve medyan değerler olarak verilmiştir. İstatistiksel değerlendirme için Kolmogorov-Smirnov, Mann-Whitney U, Ki-kare analizi kullanılmıştır.

Bulgular: Çalışmamızın sonuçlarına göre, okullarımızın çoğunda hijyeni sağlamak için yeterli koşullar bulunmasına rağmen, temiz ve güvenli içme suyuna erişim ve devamlılığın sağlanmasında sorunlar yaşanmaktadır. Ayrıca suyun korunması, muhafazası ve sürdürülebilirliği açısından yeterli müdahalelerin yapılmadığı görülmektedir. Bu bulgular doğrultusunda okul yöneticilerinin okul suyu yönetimi konusunda yeterince bilinçli olmadıkları görülmektedir.

Sonuç: Okullarda temiz, yeterli ve sürekli su temini için politikalar ve standartlar oluşturulmalı ve bu politikalar için merkezi düzeyde uygulama planları hazırlanmalıdır. Su yönetiminin önemi konusunda farkındalık yaratmak için okul yöneticilerine yönelik eğitimler düzenlenmelidir.

Anahtar kelimeler: Sağlıklı su, Su yönetimi, Okul yöneticileri, Okul sağlığı

Abstract

Aim; Rapid urbanization, industrialization, increasing population and global climate change cause the need for water to increase, and water protection and management are among the important and current discussion topics. Educational institutions such as schools, which are one of the basic building blocks of society, should also pay special attention to water management. This study aimed to determine and evaluate the situation of water

management in schools by investigating the measures taken and training activities regarding adequate, safe and continuous water supply, water use, and water saving provided in all schools in Menteşe district of Muğla province.
Method; Our study is a descriptive study. A questionnaire was administered to school administrators in 78 schools in the Menteşe district of Muğla province through face-to-face interviews. No sample was selected and the entire population was reached. The current status of water management in schools is addressed within the scope of adequate, safe and continuous water supply, water protection and sustainability. Descriptive statistics were given as number and percentage, minimum, maximum and median values. Kolmogorov-Smirnov, Mann-Whitney U, Chi-square analysis were used for statistical evaluation.
Results; According to the results of our study, although there are sufficient conditions to ensure hygiene in most of our schools, there are problems in accessing and maintaining clean and safe drinking water. In addition, it is seen that adequate interventions are not made in terms of water protection, conservation and sustainability. In line with these findings, school administrators are not sufficiently conscious about school water management.
Conclusion; Policies and standards should be established for clean, adequate and continuous water supply in schools and implementation plans should be prepared for these policies at the central level. Training should be organized for school administrators to raise awareness about the importance of water management.

Keywords: Healty water, Water management, School administrators, School health

1. Introduction

Water management is defined as the planned development, distribution and utilization of water resources [1]. Today, water is an indispensable element of life. According to the World Health Organization (WHO), over two billion people live in water-stressed countries in 2021 [2]. Turkey is among the countries included in the water stress class (1000-1700 m3 per capita) according to the amount of usable fresh water per capita (1350 m3), and it is predicted that the amount of usable fresh water per capita will decrease to 1000 m3 by 2030 [3,4]. Rapid urbanization and industrialization, increasing population, agricultural activities, animal husbandry and global climate change cause the need for water to increase, and water protection and management are among the important and current discussion topics [5]. Educational institutions such as schools, which are one of the basic building blocks of society, should also pay special attention to water management.

Schools are one of the most common public living spaces worldwide. The need for water in schools is wider than providing drinking water. Water is used in different areas such as classrooms, dining halls, canteens, sports facilities, toilets, sinks, and gardens and in various jobs to meet daily needs such as food preparation, personal and general area cleaning, and garden irrigation. For this reason, water supply that meets the standards in terms of quantity and quality in schools provides benefits in many ways. Adequate amounts of clean and safe water prepare the child to learn by providing a positive learning environment and maintaining essential body functions. Especially in insufficient water intake and dehydration, most cognitive functions and learning become difficult [6,7]. Schools are also places that prepare individuals for life and develop life skills. Healthy behaviors acquired at school positively affect the whole life and ensure the development of healthy attitudes and behaviors [5]. In order to develop and maintain personal hygiene skills such as hand washing and tooth brushing, which are extremely important for health, the infrastructure facilities that children can easily access in schools should be in sufficient number and distribution.

The fourth of the United Nations Sustainable Development Goals is "to ensure inclusive and equitable quality education and to promote lifelong learning opportunities for all". To this end, the proportion of schools with access to basic water, sanitation and hygiene services has been identified as an indicator of the goal of providing safe and effective learning environments for all (Target 4.a.1) [8]. The WHO / United Nations International Children's Emergency Fund (UNICEF) Joint Monitoring Program (JMP) report emphasizes the importance of clean and adequate water use in schools. It sets standards and indicators for water resources, sanitation and hygiene conditions. According to this report, 71% of schools worldwide reported having basic drinking water service, 14% having limited service, and 15% having no service [9]. Despite a steady decline in the proportion of schools lacking basic Water, Sanitation and Hygiene (WASH) services worldwide, deep inequalities persist between and within countries [10]. Schools with adequate water sanitation and hygiene facilities should have a safe and adequate water system for handwashing and drinking, adequate private, safe, clean, culturally and gender-appropriate toilets for students and teachers, and adequate and clean handwashing facilities. Unfortunately, it has been reported that schools on all continents in the world do not have proper WASH conditions, and even if the infrastructure is available, the amount is insufficient and is not suitable for maintaining and

promoting the health of the school community [11]. Therefore, the adequate supply, distribution, and use of water are of great importance for the health of both school staff and students, as well as for hygiene standards and the quality of the overall learning environment.

Water management in schools should also include educational activities and projects to support education and raise student's and staff's awareness about the importance of water for living things and our planet, conscious and adequate consumption of water, and water conservation. At this point, schools can be exemplary models by adopting sustainable water practices such as efficient water use, wastewater reduction, and water saving. In order for schools to fulfil all of these functions, sufficient, clean and safe water must be constantly available, used, protected, planned and managed by the principle of sustainability.

In addition to their duties related to their profession, school administrators are also responsible for many issues such as nutrition, care, cleanliness, maintaining order, protecting the health of students and employees, and ensuring that protective measures are taken in order to improve the unfavourable health conditions arising from the physical structure of the school and the environment, as stated in the Regulation on Preschool Education and Primary Education Institutions and the Regulation on Secondary Education Institutions of the Ministry of National Education in our country [12,13]. For this reason, our study was carried out by interviewing school administrators.

This study aimed to determine and evaluate the situation of water management in schools by investigating the measures taken and training activities regarding adequate, safe and continuous water supply, water use, and water saving provided in all schools in Menteşe district of Muğla province. Kısaltmalar öncelikle belirtilerek tanımlanmalı ve daha sonra tutarlı bir şekilde kullanılmalıdır.

2.Material and Method

Our study is a descriptive study. Data were collected between May 1 and July 1, 2019. A face-to-face survey was conducted with the school principals who agreed to participate in the study in all schools affiliated with the District Directorate of National Education in the Menteşe district of Muğla province and with the deputy principals who acted in their place when the school principals could not be reached for any reason. The sample is not selected. Seventy-eight school administrators were interviewed, and the entire universe was reached. The questionnaire consists of 30 questions. In the survey, the number of students and employees in the school, the total number of faucets, toilet cabins, urinals, water tanks, swimming pools, drinking and utility water resources of students and employees, discharge methods related to wastewater, analysis status of drinking and utility water, water consumption, water saving, training on issues such as water saving, measures taken to save water were questioned. The researchers calculated the number of faucets, toilet cabins, sinks, urinals, and the daily water consumption per person by dividing the monthly water consumption in the last water bill by the total number of people and 30 days. The adequacy of the number of toilet cabins and sinks for male and female students was evaluated according to the Ministry of National Education's guide to minimum standards for educational structures (one toilet and one sink for every 20 female students, one toilet and one sink for every 30 male students) [14]. Other data are based on the statements of the school administrators. While making rural-urban distinctions for schools, Conditions such as distance from the centre (those that are more than 15 kilometres away) and accessibility to services (such as education, and less access to health services), researchers' opinion (recognition of the region by researchers) were taken into consideration.

The data were evaluated using the SPSS 21 Package Program. Descriptive statistics of the results of the assessment: Number and percentage for categorical variables and minimum, maximum, and median values for numerical variables. The Kolmogorov-Smirnov test evaluated the conformity of the data to the normal distribution, and an abnormal distribution was determined. Comparisons of numerical variables between two independent groups were tested with the Mann-Whitney U test, and the differences between the ratios of categorical variables in the independent groups were tested with Chi-square analysis. The statistical significance level was accepted as $p<0.05$.
In order to conduct the study, written permission was obtained from the District Directorate of National Education and ethical approval was obtained from the Muğla Sıtkı Koçman University Clinical Research Ethics Committee (decision dated 11.04.2019 and numbered 06-I).

3. Results

In Menteşe district of Muğla province, 78 school administrators, including school principals or assistant principals, were interviewed in 10 kindergartens, 20 primary schools, 9 secondary schools, 19 combined schools (primary school+middle school, primary school+middle

school, primary school+middle school+high school) and 20 high schools affiliated to the District Directorate of National Education. 26.9% (n=21) of the schools were rural, and 73.1% (n=57) were urban. Descriptive information in schools is given in Table 1. In one of the rural schools, there were no permanent cleaning staff. While no staff were trained in plumbing in rural schools, it was found in 10.5% (n=6) of urban schools. It was stated that 9.5% (n=2) of rural schools and 8.8% (n=5) of urban schools had staff monitoring water leaks. Bathrooms and swimming pools have not been identified in rural schools. Although 26.3% (n=15) of urban schools had bathrooms, it was determined that only 14.0% (n=8) of urban schools had bathing facilities after sports. Bathrooms are out of use in seven schools. Swimming pool was available in 5.3% of urban schools (n=3). Urinals were found in 19.1% of rural schools (n=4) and 50.9% of urban schools (n=29). Drinking water taps outside the toilet in rural schools were detected in 85.7% (n=18) and 77.6% (n=45) of urban schools. It was determined that a sensor tap was used in one of the urban schools (Table 1).

Table 1: Descriptive information in schools

	Rural Schools				**Urban Schools**			
	n	**Min.**	**Max.**	**Median**	**n**	**Min.**	**Max.**	**Median**
Female student	21	4	114	27	56	1	408	113
Male student	21	5	129	21	57	14	393	121
Administrator	21	1	5	1	57	1	7	2
Teacher	21	1	25	7	57	3	91	23
Permanent cleaning staff	20	1	5	1	57	1	36	5
	n		**%**		**n**		**%**	
Presence of staff trained in plumbing	0		0		6		10.5	
Presence of staff in charge of monitoring water leaks	2		9.5		5		8.8	
Water dispenser in school	6		28.6		44		77.2	
Water purifier in school	0		0		29		50.9	
Water tanks in school	1		4.8		26		45.6	
Bathroom in school	0		0		15		26.3	
Swimming pool in school	0		0		3		5.3	

When drinking and utility water resources were examined in schools, it was determined that 88.5% (n=69) used municipal water and 55.1% (n=43) used packaged water. Municipal water was used in 98.7% (n=77) of schools for general cleaning, and 93.6% (73) for irrigation purposes has been determined. The wastewater discharge method was stated as general sewage in 53.8% (n=42) of the schools and tight tank in 46.2% (n=36). It has been reported that the water flow chart showing the indoor network system is found in only 1.3% (n=1) of the schools. 87.2% (n=68) of the school administrators said there was no water flow chart, and 11.5% (n=9) said they did not know whether there was. Considering the situation of experiencing water outages in the last year, it was stated that 20.5% (n=16) of them, primarily in urban schools, experienced non-long-term water outages. It was stated that packaged water was used as drinking water in all schools during the outage, tank water was used in four schools as cleaning and utility water, and the outage was expected to end in other schools (Table 2).

It was stated that 52.6% (n=41) of the schools were routinely analyzed by the Provincial Health Directorate, and 2.5% (n=2) were routinely analyzed in a private laboratory. Of these 43 schools, 60.5% (n=26) did not know when the last analysis was performed, and 46.5% (n=20) did not know the analysis frequency. It was determined that 34.6% (n=27) of the schools had water tanks, 48.2% (n=13) of these tanks were not cleaned, 33.3% (n=9) were cleaned once a year, 18.5% (n=5) were cleaned at intervals of six months or more, and only 22.

Table 2: Water Resources Used in Schools and Wastewater Discharge Methods

	Rural Schools		Urban Schools		Total	
	n	**%**	**n**	**%**	**n**	**%**
Drinking and utility water resources						
Municipal water	21	100.0	48	84.2	69	88.5
Packaged water	7	33.3	36	63.2	43	55.1
Flask bottle	10	47.6	22	38.6	32	41.0
Carboy water	0	0.0	4	7.0	4	5.1
Artesian water	0	0.0	1	1.8	1	1.3
Water sources used in general (classroom, corridor, toilet) cleaning						
Mains water	21	100.0	56	98.2	77	98.7
Artesian water	0	0.0	1	1.8	1	1.3
Water sources used for irrigation purposes (garden, flower)						
Mains water	21	100.0	52	91.2	73	93.6
Artesian water	0	0.0	2	3.5	2	2.6
Not in use	0	0.0	3	5.3	3	3.8
Wastewater discharge method						
General sewage	0	0.0	42	73.7	42	53.8
Tight tank	21	100.0	15	26.3	36	46.2
Water flow chart showing the indoor network system						
Available	0	0.0	1	1.8	1	1.3
Not available	13	61.9	55	96.5	68	87.2
Unknown	8	38.1	1	1.8	9	11.5
Experiencing water outage (within the last year)						
Yes	1	4.8	15	26.3	16	20.5
No	20	95.2	42	73.7	62	79.5

(n=6) had staff in charge of cleaning water tanks. It has been declared that the water in the water tank is not used as drinking water in any school (Table 3).

Table 4 shows information about the training activities carried out for students and staff in schools in the last year. In schools, most of the most common training was given to students about hand washing habits. Training on water consumption, hygiene, water conservation, and waterborne infections was found to be very insufficient. Staff were not trained in most of the schools (Table 4).

In non-pension schools, 74.6% (n=53) female student toilet cabins, 77.3% (n=62) male student toilet cabins, 76.1% (n=54) female student sinks, 85.9% (n=61) male student sinks, and 39.3% (n=11) male urinals were found to be sufficient for students. In rural areas, the percentage of schools where the number of female students is sufficient for one toilet cabin and one sink is significantly higher. In rural areas, the percentage of schools where the number of male students is sufficient for one sink is significantly higher. The number of students in rural schools was significantly lower for a drinking tap outside the toilet. Rural and urban schools had no difference in daily water consumption per capita (Table 5).

All administrators answered no to the question, "Are there any measures taken to save water in your school?"

Table 3: Analysis of Municipal Water in Schools and Information on Water Tank

	Rural Schools		Urban Schools		Total	
	n	%	n	%	n	%
Routine status of municipal water analysis (n=78)						
Provincial Directorate of Health	18	85.7	23	40.4	41	52.6
Private laboratory	0	0.0	2	3.5	2	2.5
It is not known whether it was done or not	3	14.3	19	33.3	22	28.2
Not analyzing	0	0.0	13	22.8	13	16.7
When was the last municipal water analysis performed (n=43)						
6 months and earlier	6	33.3	6	24.0	12	27.9
1 year ago	1	5.6	4	16.0	5	11.6
Unknown	11	61.1	15	60.0	26	60.5
Frequency of municipal water analysis (n=43)						
Three and less per year	4	22.2	10	40.0	14	32.5
4-12 per year	8	44.5	1	56.0	9	21.0
Unknown	6	33.3	14	4.0	20	46.5
Availability of a water tank						
Yes	1	4.8	26	45.6	27	34.6
No	20	95.2	31	54.4	51	65.4
Frequency of cleaning the water tank						
Not cleaning	1	100	12	46.1	13	48.2
Once a year	0	0.0	9	34.6	9	33.3
With an interval of six months and more often	0	0.0	5	19.3	5	18.5
Personnel on duty for water tank cleaning						
Yes	0	0.0	6	23.1	6	22.2
No	1	100.0	20	76.9	21	77.8

Table 4: Training Activities for Students and Staff in Schools

	Rural Schools				Urban Schools				Total			
	Student Training		Staff Training		Student Training		Staff Training		Student Training		Staff Training	
	n	%	n	%	n	%	n	%	n	%	n	%
Hand washing habits	20	95.2	1	4.8	52	91.2	3	5.3	72	92.3	4	5.1
İmportance of adequate water consumption	17	81.0	1	4.8	34	59.6	2	3.5	51	65.4	3	3.8
General body hygiene	13	61.9	1	4.8	37	64.9	2	3.5	50	64.1	3	3.8
The importance of water conservation	14	66.7	0	0.0	30	52.6	2	3.5	44	56.4	2	2.6
Food hygiene	10	47.6	1	4.8	21	36.8	2	3.5	31	39.7	3	3.8
Waterborne infections	4	19.0	1	4.8	9	15.8	2	3.5	13	16.7	3	3.8

*Since more than one education is provided in each school, the total can exceed 100%.

Table 5: Comparison of Some Characteristics Between Rural and Urban Schools*

	Rural Schools (n=21)		Urban Schools (n=50)		Total		p
	n	%	n	%	n	%	
Number of female students for a toilet cabin							
Sufficient	20	95.2	33	66.0	53	74.6	**0.022**
Insufficient	1	4.8	17	34.0	18	25.4	
Number of male students for a toilet cabin							
Sufficient	21	100.0	41	82.0	62	87.3	0.050
Insufficient	0	0.0	9	18.0	9	12.7	
Number of female students for a sink							
Sufficient	20	95.2	34	68.0	54	76.1	**0.032**
Insufficient	1	4.8	16	32.0	17	23.9	
Number of male students for a sink							
Sufficient	21	100.0	40	80.0	61	85.9	**0.028**
Insufficient	0	0.0	10	20.0	10	14.1	
Number of male students for a urinal							
Sufficient	2	50.0	9	37.5	11	39.3	1.000
Insufficient	2	50.0	15	62.5	17	60.7	
Number of students for a drinking water tap outside the toilet							
	n	**Min.**	**Max.**	**Median**			**p**
Rural Schools	18	5.0	81.0	15.4			**<0,001**
Urban Schools	45	7.4	649.0	65.5			
Daily water consumption per person (lt/day)							
Rural Schools	13	2.5	41.7	11.9			0.228
Urban Schools	54	0.3	291.1	15.3			

*: Schools with pension (n=7) were excluded from the evaluation.

4. Discussion

Studies in the literature deal with the issue of water in schools; They focus on students' water consumption habits, water conservation and hygiene. Studies on water management in schools are extremely limited. This study discusses the current status of water management in schools within the scope of adequate, safe and continuous water supply, water protection and sustainability. The issue was evaluated by school administrators, and why it was important was discussed.

According to the minimum standards guide for educational buildings published by the Ministry of National Education of the Republic of Turkey in 2015, it is necessary to plan school buildings with a toilet and a sink for every 20 female students, a toilet and a sink for every 30 male students, and a urinal for every 20 male students [14]. In our study, according to this guideline, toilet cabins are sufficient for female students in 74.6% of schools and for male students in 87.3% of schools. The sink is sufficient for female students in 76.1% of schools and for male students in 85.9% of schools. Urinals were sufficient for male students in 39.3% of schools. Schools in urban areas are more disadvantaged in terms of the number of students for toilet cabins, sinks, urinals, and taps where water can be drunk outside the toilet because the number of students tends to increase gradually due to reasons such as the high number of students and migration between rural and urban. In the research conducted by Ayşe Meydanlıoğlu et al. on water, sanitation and hygiene conditions in schools in Antalya, adequate toilets were found for female students in 42.3% of the schools and for male students in 72.8% of the schools. 87.7% of the schools had sufficient sinks for female students and 85.7% for male students. They stated that these rates were lower in schools in the central district [15]. It seems that there is a similarity with our study. This situation suggests a need to construct new school buildings, especially considering the number of students in urban areas.

Globally, according to the WHO/UNICEF JMP report published on June 23, 2022, only 71% of schools have basic drinking water services. Basic drinking water service has been defined as the presence of schools' access to improved water sources such as municipal water and packaged water [9]. In our study, municipal water is available in all schools. When we look at drinking and utility water

resources, municipal water is used predominantly, more in schools in rural areas. Packaged water is quite frequent, more so in schools in urban areas. At the same time, it was determined that 85.7% of rural and 78.9% of urban schools had taps that could be used to drink water outside the toilets. It was determined that the number of students for a tap where water can be drunk outside the toilet was very high and statistically significantly higher in urban schools than in rural schools. It is seen that the number of taps that can be drunk in schools outside the toilets is insufficient compared to the number of students. This explains the use of packaged water as drinking water. The study conducted in Antalya determined that 4.5% of the schools met the drinking water needs of the students from the taps in the toilets [15]. Drinking water from the sinks in the toilets brings many health risks, such as infectious diseases. In addition, this may be an important factor that prevents adequate water consumption due to the foul-smelling and dirty toilets [16].

Considering the climatic conditions, Muğla receives more than 1,000 mm of precipitation per square meter annually and is one of the provinces with the highest rainfall in Turkey [17,18]. Unfortunately, despite having rich water resources, there is a shortage of surface and groundwater reserves in the settlements in the northern part of Muğla province (Menteşe) due to its geological structure [19]. In recent years, with the effect of global climate change, available resources have also tended to decrease rapidly. In our study, using municipal water for general cleaning and irrigation purposes in schools is very frequent. For these purposes, water obtained from wastewater treatment, planning, and dissemination of rainwater collection, storage, and use systems are essential for the sustainability of existing water. A study conducted in a rural primary school in Tunisia showed that water consumption was reduced by 50% by methods such as installing a rainwater harvesting system and using it in toilet flushes, treating wastewater and using it for garden irrigation [20].

Rural and urban schools had no difference in daily water consumption per capita. The fact that daily water use is determined in extensive ranges can be explained by reasons such as the difference in the purpose of use of municipal water in schools, the difference in the size of the areas that require cleaning and the size of the irrigated areas, and water losses from old plumbing structures. It was found that the number of staff trained in plumbing and those in charge of monitoring water leaks in schools was deficient. It has been reported that the water flow diagram showing the indoor network system is only in one school. In their study by Ayşe Muhammetoğlu et al., which monitored water leaks in public spaces, including schools, they stated that long-term water losses are common because users or administrators do not pay the cost of the lost water directly. They found that these leaks could be tracked with smart meter [21]. In order to make water use efficient in schools and to manage it in a planned manner, it is necessary to know the network system, to monitor the water bills in terms of consumption, and if necessary, to place water meters at strategic points, to identify and intervene in the areas where water is consumed too much and where there is a plumbing leak. In addition, new employment areas should be created in schools' plumbing, and existing staff should be given training and responsibility. Water losses can be reduced by monitoring leaks, preventing leaks, and repairing and renewing plumbing.

In addition to the adequate use of water to meet the needs in schools, the economical use to prevent waste is essential for the protection and sustainability of existing water resources. Water conservation aims to conserve resources and supports the mission of raising environmental awareness in students and raising conscious individuals for a sustainable future. Saving water in schools is a small but effective step towards a greener and healthier world today and for future generations. Our study determined that sensor taps were used only in one of the urban schools. It has been stated that no measures have been taken to save water in any school. For these reasons, it is essential to replace all taps in schools with low-flow or sensor fixtures, to prefer low-volume reservoirs, and to replace all the equipment used with new and water-saving equipment if they are old [22]. It is also necessary to have plans for water network systems for possible maintenance and repair works and to be known by managers.

In addition to providing clean and safe water, it is also essential to provide water continuously. It was stated that one-fifth of the schools, mainly urban schools, experienced a water outage in the last year, and in case of an outage, packaged water was used as drinking water, and tank water was used as cleaning and utility water in four schools. In contrast, the other schools were expected to end the outage. On the other hand, it was determined that about half of the schools with water tanks did not clean the water tanks at all, only about one-fifth were cleaned frequently enough, and one-fifth had staff responsible for cleaning them. It is essential to clean and disinfect water tanks regularly, if possible, every six months to ensure safe water [5]. Although it was declared that tank water was not used as drinking water in any of the schools, the statement that it was used as cleaning and domestic water in some schools that experienced interruptions suggests that administrators do not have sufficient knowledge on this issue.

According to the Regulation on Water for Human Consumption, health monitoring and inspection of drinking and utility water is carried out by the provincial organization of the Ministry of Health [23]. School administrators stated that routine water analyses were carried out by the Provincial Health Directorate in about half of the schools and in a private laboratory in two. Knowledge on this issue seems to be problematic, especially in urban schools. Six out of ten schools where routine water analysis was performed did not know when the last analysis was performed, and about half did not know the analysis frequency. It can be said that school administrators do not have enough information about these monitoring and inspections, and they do not follow them.

When the trainings given in schools are examined, it is determined that students and staff are not given sufficient training on the importance of water consumption, water conservation, food hygiene, and waterborne infections. Regarding hand washing habits, students were trained in 92.3% of the schools, and staff training was insufficient. The study conducted by Middlestadt et al. reported that the water education given to the students increased their knowledge about water saving and positively changed their water consumption behaviours [24]. Similarly, in many studies in the literature, it has been observed that all kinds of activity-based programs with students have positive results on students' water literacy [25,26]. A study conducted in Guangzhou, China, found that water education in primary and secondary schools accounted for only 0.2-1.4% of the curriculum [27]. For this reason, it is necessary to create a culture of efficiency and savings among staff, teachers and students in educational institutions and carry out projects with content that include water-related social activities.

Limitations

The limitation of this study was that some data were evaluated according to the statements of school administrators. This may have been influenced by bias in the responses given by school administrators. In the calculation of daily water consumption per person, water consumption may not be standardized because measurements such as the surface area of the schools that require cleaning, the size of the irrigation areas, and the age of the building are not taken. The fact that our study was carried out in only one district is another limitation. This can create a generalization problem.

5. Conclusion

According to the results of our study, in which we examined the issue of water management in schools, although there are sufficient conditions to ensure hygiene in most of our schools, there are problems in accessing and maintaining clean and safe drinking water. In addition, it is seen that adequate interventions are not made in terms of water protection, conservation and sustainability. In line with these findings, school administrators are not sufficiently conscious about school water management. As a result, policies and standards should be established for clean, adequate and continuous water supply in schools, and implementation plans should be prepared for these policies at the central level. Training should be organized for school administrators to raise awareness about the importance of water management in schools and the work that can be done. The issue of water management in schools should be handled professionally, and legislative arrangements should be made at the central level.

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6. Referanslar

1. Aküzüm T, Çakmak B, Gökalp Z. Evaluation of Water Resources Management in Turkey. Research Journal of Agricultural Sciences. 2010;3(1):67-74.
2. World Health Organization. Drinking-water. https://www.who.int/news-room/fact-sheets/detail/drinking-water access date 19.03.2024
3. Çorba S. Future Danger: Water scarcity. The Scientific and Technological Research Council of Turkey (TÜBİTAK). https://bilimgenc.tubitak.gov.tr/makale/gelecekteki-tehlike-su-kitligi access date 19.03.2024
4. Republic of Turkey Ministry of Foreign Affairs. Turkey's Policy on Water Issues. https://www.mfa.gov.tr/turkiye_s-policy-on-water-issues.en.mfa access date 19.03.2024
5. Adıgüzel A. Su ayak izi. 2nd International Water and Health Congress Book; 2017. ISBN: 978-605-64857-8-7.
6. Perry CS, Rapinett G, Glaser NS, Ghetti S. Hydration status moderates the effects of drinking water on children's cognitive performance. Appetite. 2015;95:520-527.

7. Patel A, Hampton KE. Encouraging Consumption of Water in Schooland Child Care Settings: Access, Challenges, and Strategies for Improvement. Am J Public Health. 2011;101(8):1370–1379.
8. Republic of Turkey Presidency of Strategy and Budget. Sustainable Development Goals And Indicators. http://www.surdurulebilirkalkinma.gov.tr/amaclari/. access date 21.03.2024
9. WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene. Progress on drinking water, sanitation and hygiene in schools 2000-2021 data update. https://data.unicef.org/resources/jmp-wash-in-schools-2022/ access date 03.03.2024
10. UNICEF, WHO. Schools ill-equipped to provide healthy and inclusive learning environments for all children. https://www.unicef.org/press-releases/schools-ill-equipped-provide-healthy-and-inclusive-learning-environments-all access date 05.03.2024
11. Poague KIHM, Blanford JI, Anthonj C. Water, sanitation and hygiene in schools in low-and middle-income countries: a systematic review and implications for the COVID-19 pandemic. International Journal of Environmental Research and Public Health. 2022;19:3124.
12. Ministry of National Education Regulation on Preschool Education and Primary Education Institutions, Article 39. Issue number: 29072, Date: July 26 2014. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.mevzuat.gov.tr/File/GeneratePdf?mevzuatNo=19942&mevzuatTur=KurumVeKurulusYonetmeligi&mevzuatTertip=5 access date 05.03.2024
13. Ministry of National Education Regulation on Secondary Education Institutions, Article 78. Issue number: 30182, Date:16 September 2017. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.mevzuat.gov.tr/File/GeneratePdf?mevzuatNo=18812&mevzuatTur=KurumVeKurulusYonetmeligi&mevzuatTertip=5 access date 05.03.2024
14. Republic of Turkey Ministry of National Education. Educational Buildings Minimum Design Standards Guide 2015. https://iegm.meb.gov.tr/www/egitim-yapilari-asgari-tasarim-standartlari-kilavuzu-2015/icerik/298. access date 25.03.2024
15. Meydanlıoglu A, Akcan A, Yalçın E. Water, sanitation, and hygiene conditions in schools in Antalya in Turkey: a descriptive survey. Journal of Water, Sanitation and Hygiene for Development. 2022;12(9):625-633.
16. Croghan EL. A survey of drinking and toilet facilities in local state schools. British Journal of Community Nursing. 2002;7(2):76-79.
17. Muğla Provincial Directorate of Culture and Tourism. Geography (Location-Climate-Transportation). https://mugla.ktb.gov.tr/TR-270591/cografya-konum-iklim-ulasim.html access date 02.03.2024
18. Republic of Turkey Ministry of Environment, Urbanization and Climate Change. Seasonal normals of provinces (1991-2020). https://www.mgm.gov.tr/veridegerlendirme/il-ve-ilceler-istatistik.aspx?k=H&m=MUGLA access date 03.03.2024
19. Atabey E. Muğla Province Water Resources / Potential / Quality and Measures to be Taken. https://www.bodrumguncelhaber.com/mugla-ili-su-kaynaklari-potansiyeli-kalitesi-ve-alinacak-onlemler/ access date 29.03.2024
20. Saad MB, Bousselmi L, Masi F, et al. A new approach for local wastewater management sanitation case study of rural school (Chorfech 24). Water Practice and Technology. 2015;10(3):474- 477.
21. Muhammetoglu A, Albayrak Y, Bolbol M, et al. Detection and assessment of post meter leakages in public places using smart water metering. Water Resources Management. 2020;34:2989-3002.
22. Öztürk M. (2018). Guide to Using 35% Less Water in Homes and Workplaces. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://bartin.ticaret.gov.tr/data/60af97c213b876d2e836e172/712721b181390541a14dd940cd192ff3.pdf access date 29.03.2024
23. Republic of Turkey Ministry of Health. Regulation on Water for Human Consumption. https://www.resmigazete.gov.tr/eskiler/2013/03/20130307-7.htm access date 29.03.2024
24. Middlestadt S, Grieser M, Hernandez O, et al. Turning minds on faucets off: water conservation education in Jordanian schools. The Journal of Environmental Education. 2001;32(2):37-45.
25. Ursavaş N, Aytar A. Analysing preschool students' water awareness and water literacy development in a project based study. Journal of Research in Informal Environments. 2018;3(1):19-45.
26. Sözcü U, Türker A. Examining the water literacy levels of high school students according to some variables. Asian Journal of Education and Training. 2020;6(3):569-582.
27. Xiong YJ, Hao XR, Liao C, et al. Relationship between water-conservation behaviour and water education in Guangzhou, China. Environmental Earth Sciences. 2016;75:1-9.