

**DISPOSING OF SEWAGE IN PUBLIC HOSPITALS OF RASHT CITY - THE
ECONOMIC AND ENVIRONMENTAL EFFECTS****Gholamreza Khoshnoodi¹, Abdollah Poursamad*² and Abbas Ghavam³**¹Department of Healthcare Management, Marvdasht Branch, Islamic Azad University, Marvdasht, Iran.²Ph.D in Health Economics, Department of Nursing, Faculty of Nursing, Yasuj University of Medical Sciences. Yasuj, Iran.³Assistant Professor, Department of Environmental Science, Institute of Sciences and High Technology and Environmental Sciences, Graduate University of Advanced Technology, Kerman, Iran.***Corresponding Author: Abdollah Poursamad**

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ABSTRACT

Sewage produced by hospitals is one of the health issues and it is of great importance due to having detrimental, toxic and pathogenic agents. The aim of this study is therefore to investigate the condition of sewage disposal in public hospitals and its effect on the environment and economy. The obtained correlation equal to 0.281 confirms the relationship between proper sewage disposal and economy. Also, the calculated correlation is significant at the level of 0.01 (because sig = 0.0). Thus, the null hypothesis is rejected and it can be said with 99% likelihood that there is a significant relationship between proper sewage disposal and economy ($p = 0.001$).

KEYWORDS: Waste, Hospital sewage, Economy, Environment.**INTRODUCTION**

Sewage is one of the most important factors in water pollution and needs to be collected, refined and restored to water cycle in the nature.^[1] The sewage produced by hospitals contain chemical wastes, microorganisms and antibiotic-resistant bacteria, heavy metals, radioactive and chemical toxic elements, hormones and wastes of antiseptic substances^[2] and a refinery is required at place for refining them. It is clear that hospital sewage is of great importance regarding this issue and if Sewage is not refined and released, it will become a source for pollution spread. Water pollution resulting from chemical and hospital wastes causes a lot of problems and makes surface and underground water sources polluted.^[3] The sewage produced by hospitals is qualitatively similar to urban wastes. However, it may also contain potential toxic and infectious compounds which threaten the health of hospital staff and whole society. In developed and some developing countries, the produced Sewage is in diluted form because much water is consumed in hospitals and hospital wastes are refined in urban refineries without a need for any additional refinement and they should be collected and disinfected under certain circumstances like the spread of acute diarrhea disease without any threat for environmental health. In those countries in which there is no network for collecting sewage, if sewage disposal is done in an

unrefined form or in complete way, it will pose inevitable threats to the health of the whole society.^[4]

The amount of hospital wastes is different between societies. The amount of sewage production is 1000 liters per bed in the hospitals of America. This is 745 liters on average in a day per bed in our country.

The hospital sewage has non-metabolized compounds, antibiotics, antiseptics, cytostatic agents, aesthetic drugs, radioactive, opaque substances of X-ray and other chemical compounds which are resistant and dangerous.

In addition to resistant compounds which are hard to dissolve, a variety of pathogenic agents resistant to antibiotics can enter aqueous systems and other natural resources through common refinery systems and transmit acute diseases to human beings.^[5] Therefore, it is important to refine hospital sewage prior to discharging into urban sewage system. Coagulation process may be used as a pre-refinery one in sewage disposal.^[6] Since one of the environmental problems caused by hospital wastes in public hospitals of Rasht is their discharge like as urban sewage disposal without initial refinery into the urban sewage pipeline, contaminants present in hospital wastes, techniques for pollution and environmental threats reduction and its economic effects were analyzed.

METHODOLOGY AND MATERIALS

This study was conducted based on a descriptive survey method and it is considered as a cross-sectional one. Data collection was carried out using interview, observation and questionnaire in 2015 in all public hospitals of Rasht. The general status of sewage disposal in those hospitals was studied considering 28 items and simultaneously the status of the refinery system and the way of sewage disposal in public hospitals of the city were inspected. The information was collected by a questionnaire and 382 questionnaires were gathered and completed by questioning hospital staff and those who referred to hospitals.

Next, data was analyzed by SPSS software, version 21 and descriptive and deductive statistics, Pearson correlation test and also one-sample Kolmogorov-Smirnov test.

RESULTS AND DISCUSSION

3.1. Descriptive results

In this research, 264 subjects and 118 ones of 382 respondents were male (69.1%) and female (30.9%) respectively (Table 1). Moreover, 153 subjects (40.1%) were single and 229 subjects (59.1%) were married. Of this population, 80 respondents were unemployed (20.9%), 136 subjects (35.6%) were employees, 97 subjects (25.4%) were housekeeper and 69 subjects (18.1%) were university students. Also 12 respondents (3.1%) had an elementary education grade, 27 subjects (7.1%) had guidance school grade, 59 subjects (15.4%) had diploma, 81 respondents (21.2%) had A.D and 203 subjects (53.1%) had B.A and higher degrees.

3.2. Deductive results

To analyze the effect of proper sewage disposal on the environment and natural resources, Pearson correlation was used. This coefficient indicates the extremity and type of the relationship (direct or inverse) between the two variables and its value is in the range of 1 to -1. The results from Pearson correlation coefficient in Table 2 show that the relationship between proper sewage disposal and its significant effect on the environment and natural resources is positive correlation (direct). According to the values (0.00), correlation is significant at 99% confidence level and higher.

There is also a significant correlation between proper sewage disposal and its significant effect on the environment and natural resources.

Thus, findings demonstrate that there is a significant relationship at level 0.306 between proper sewage disposal and its significant effect on the environment and natural resources.

To analyze the relationship between proper sewage disposal and economy in public hospitals of Rasht city according to the results of Table 3, we see that the

correlation at level 0.281 confirms the relationship between proper sewage disposal and economy.

Also the estimated correlation is significant at level 0.01 (for sig = 0.0). Thus, the null hypothesis is rejected and we can say with 99% confidence that there is a significant relationship between proper sewage disposal and economy.

To study the relationship between systematic sewage disposal in public hospitals of Rasht and proper management according to the data of Table 4, we observe that the correlation at level 0.458 supports the relationship between proper management and systematic sewage disposal.

Also the calculated correlations is significant at level 0.01 (because sig = 0.0). So the null hypothesis is rejected and we can say with 99% confidence that there is a meaningful relationship between proper management and systematic sewage disposal.

To investigate the relationship between proper management and systematic sewage disposal using modern techniques according to the results of Table 5, it is observed that the correlation at level 0.145 supports the relationship between modern techniques and proper sewage disposal. Also the calculated correlation is significant at level 0.04 (Because sig = 0.04). So the null hypothesis is rejected and we can say with 95% confidence that there is a weak meaningful relationship between proper management and systematic sewage disposal.

Various studies show that hospital sewage must not be released without being refined.^[7-8] The study conducted by Samaei and Mokhtari in 2008 emphasizes a need for using more modern methods to remove contaminants from hospital sewage.^[8] Another work carried out by Akbarpour in 2007 indicates that 144 public hospitals and 85 private hospitals of Tehran have installed refinery system and 39 hospitals discharge sewage into the sinkhole which may contaminate underground waters due to having heavy metals. He believes that the major problem in hospitals is not supplying credit.^[9] The sewage produced by hospitals may contain different types of pathogenic microorganisms and chemical substances, other toxic agents and solid wastes, and radioactive isotopes.^[10] If they discharge into the environment especially surface and underground water sources, they will cause major problems in Rasht city; thus it is necessary to have precise information about the situation of sewage production in the hospitals and make preparations for preventing sewage from finding a way into the environment and surface and underground water supplies since sewage causes the spread of disease among healthy people.

Table 1: Descriptive table of the respondents.

Number of respondents	Men		Women		
382	264 (69.1%)		118 (30.9%)		
Number of respondents	Single		Married		
382	153 (40.1%)		229 (59.1%)		
Number of respondents	Unemployed	Employed	Housekeeper	Student	
382	80 (20.9%)	(35.6%)	97 (25.4%)	69 (18.1%)	
Number of respondents	Elementary school grade	Guidance School grade	Diploma	A.D degree	B.A and higher degrees
382	12(3.1%)	27 (7.1%)	59 (15.4%)	81 (21.2%)	203 (53.1%)

Table 2: The relationship between proper sewage disposal and its effect on the environment and natural sources.

Correlations			
-	-	Significant effect on the environment and natural resources	Proper sewage disposal
Significant effect on the environment and natural resources	Pearson Correlation	1	** .306
	Sig. (2-tailed)	-	.000
	N	382	382
Proper sewage disposal	Pearson Correlation	** .306	1
	Sig. (2-tailed)	.000	-
	N	382	382

Table 3: The relationship between proper sewage disposal of the hospital and economy.

Correlations			
-	-	Significant effect on the economy	Proper sewage disposal
Significant effect on the economy	Pearson Correlation	1	** .281
	Sig. (2-tailed)	-	.000
	N	382	382
Proper sewage disposal	Pearson Correlation	** .281	1
	Sig. (2-tailed)	.000	-
	N	382	382

Table 4: The relationship between proper management and sewage disposal using modern techniques.

Correlations			
-	-	Hospital sewage	Proper management
Hospital sewage	Pearson Correlation	1	458.**
	Sig. (2-tailed)	-	.000
	N	382	382
Proper management	Pearson Correlation	458.**	1
	Sig. (2-tailed)	.000	-
	N	382	382

Table 5: The relationship between proper management and hospital sewage disposal using modern techniques.

Correlations.			
-	-	Proper hospital sewage disposal	Using modern techniques
Proper hospital sewage disposal	Pearson Correlation	1	145.**
	Sig. (2-tailed)	-	.04
	N	382	382
Using modern techniques	Pearson Correlation	145.**	1
	Sig. (2-tailed)	.04	-
	N	382	382

CONCLUSION

Although sewage disposal is not optimal in Rasht hospitals, we can prevent its harmful effects by proper actions, credit supply and giving awareness and insight and reuse it in an appropriate way. Thus it is necessary to conduct more specialized researches like this, give a positive attitude to the managers and planners and supply a credit for refining sewage at all hospitals of the city, appoint leaders for maintaining water facilities and train them, monitor sewage refinery systems, overcome the current problems in refinery facilities, use those facilities which remained useless due to a connection to urban sewage pipeline and using active sludge system and finally reuse refined sewage to irrigate plants and trees.

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REFERENCES

1. MetCalf and Eddy, Inc. "Wastewater Engineering Treatment, Disposal, Reuse" 2nd ed. Mc GrowHill, 2005.
2. B. Jolibois, M. Gugerbet, and S. Vassal, Glutaraldehyde in hospital wastewater, Arch. Environ. Contam. Toxicol, 2002; 42: 137-144. New York.
3. M. Yan, D. Wang, B. Shi, M. Wang, Y. Yan, Effect of Pre-ozonation on Optimized Coagulation of a Typical North-China Source Water. Chemosphere, 2007; 69(11): 1695-1702.
4. Majlesi Nasr M, A. Yazdanbakhsh, Study On Wastewater Treatment Systems in Hospitals of Iran, Iran J Environ. Healt. Sci. eng, 2011.
5. E. Emanuel, Y. Perrodin, J. Blanchard, P. Vermande, Chemical, Biological and Ecotoxicological of Hospital Wastewater. J. Sci. Tech, 2010; 2: 31-33.
6. M. Rossini, J. Grrido, M. Glluzzo, Optimization of the coagulation flocculation treatment: influence of rapid mix parameters, Water Res, 33: 1817-1826.
7. M. Seifrtová, A. Pena, C. Lino, P. Solich, Determination of fluoroquinolone antibiotics in hospital and municipal wastewaters in Coimbra by liquid chromatography with a monolithic column and fluorescence detection. Anal Bioanal Chem, 2008; 391(3): 799-805.
8. M.R. Smayy, M. Mokhtari, M.H. Ahrampvsh, Using SBR system developed system to remove detergent organic matter from hospital wastewater, Eleventh National Conference of Environmental Health Hospital, November 2008; 7-8. Zahedan, Iran.
9. F. Akbarpour, Environmental status report Tehran hospitals, Tehran: Tehran Office Environment, 2008.
10. H.C. Liu, J. Wu, P. Li, Assessment of health-care waste disposal methods using a VIKOR-based fuzzy

multi-criteria decision making method, Waste Management, 2013; 33(12): 2744–2751.