

ROLE OF TOILET TYPE IN TRANSMISSION OF INFECTIONS

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ABSTRACT

Context: There are two types of toilets including the dry toilet and the wet toilet and the most common type of toilet is the **flush toilet** that is a wet toilet. Some people due to some cultural and religious matters are less likely to use these toilets and usually use the squat toilets. Finding some scientific documentation would result in a better judgment about the best toilet.

Aims: This study was conducted to obtain definite results about the role of toilet type in transmission of infections.

Settings and Design: Home Toilets, Cross-sectional study

Methods and Materials: Forty toilets including 20 sitting and 20 squat toilets were selected and the frequency of pathogenic germs and their types were determined and compared between two groups. All the toilets were white and it was one year passed from their manufacture.

Statistical Analysis: The statistical analysis of data obtained from the toilets was performed using SPSS version 14.0 software using the Fisher and Chi-square tests.

Results: The frequency and microorganisms was differed between two types of toilets and the sitting toilets had fewer microorganisms ($P > 0.05$). But the frequency of gastrointestinal and non-gastrointestinal germs was not significantly differed between squat and sitting toilets ($P > 0.05$).

Conclusions: Totally, according to our findings, it may be concluded that use of sitting toilets should be encouraged to reduce the rate of infection transmission and prevention of gastrointestinal, respiratory, and genital infectious diseases.

Keywords: Toilet Type, Transmission, Infections

INTRODUCTION

The toilet is a system for the disposal of the **body wastes** [1]. There are two types of toilets including the dry toilet and the wet toilet and the most common type of toilet is the **flush toilet** that is a wet toilet [2]. In the other hand, there are two types of toilets including the sitting toilet and the squat toilet [3]. The most common type in western societies is the sitting toilet [3]. However, the **squat toilets** are extensively used by the majority of the world's population including Iran.

Toilet facilities are an important tools integrated in gastrointestinal health in general population especially in children with integration in fecal-oral transmission of diseases [4, 5]. Especially when not cleaned in a routine periodical manner these are a major source of microbial transmission and act as a hidden source for infections [6]. The ability to enforce the transmission of bacteria is relatively related to structure of toilets and those toilets more difficult to be washed and cleaned are more possible to help to transmission of infections [7]. Squat toilets are an example of this matter. These toilets that are extensively used in Iran are not deep enough and the infectious droplets may reflect to subjects' bodies. Also these toilets have many inaccessible sites that may not be washed easily and these matters would result in a higher risk for infection transmission compared with sitting toilets [8, 9]. In the other hand the sitting toilets that are not routinely used in Iran, are more easily cleaned and

also have less inaccessible sites and angles [10]. This matter may result in a lower transmission of infections [11]. But Iranian people due to some cultural and religious matters are less likely to use these toilets and usually use the squat toilets. Finding some scientific documentation would result in a better judgment about the best toilet. Accordingly, this study was conducted to compare the frequency and type of the microbial germs isolated from both sitting and squat toilets.

RESEARCH METHODS

In this descriptive cross-sectional study, 40 toilets including 20 sitting and 20 squat toilets were selected and the frequency and the presence of pathogenic germs and their types were determined and compared between two toilets. All the toilets were white and only one year was passed from their manufacture.

The toilets with hazy appearance and some minor and major fractures and also those out of homes (in public places) were excluded from the study. The sampling was performed with both sterile hard and soft swabs and the samples were incubated in different culture media (according to probable germs) for 48 hours. The microbiological results were then evaluated and presence and type of microorganisms were determined in two toilets.

The statistical analysis of data obtained from the toilets was performed using SPSS version 14.0 software (SPSS Inc, Chicago, IL) using the Fisher and chi-square tests. A *P* value of 0.05 was considered significant.

DISCUSSION

This study was conducted to compare the presence of pathogenic microorganisms between two types of toilets including sitting and squat toilets. The study showed interesting results and the frequency of microorganisms was differed between two types of toilets and squat toilets had more germs. However the types of microorganisms were alike between two types of toilets.

Non-public toilets are almost never separated by sex and all people usually use squat toilets in Iran. The importance of this matter is because of an increased risk of infection in female subjects due to easy transmission of microbial germs reflected from the bowl to their genitalia leading to vaginal infections that also may be transmitted to their sexual partners via intercourse. The importance of matter is especially more in Iranian people that usually have hand contacts with their anus for washing the fecal matter from it and rub their hand in a forward direction (from the anus to the perineum) that would facilitate the transmission of infection especially in women and children [12, 13, 5].

Many people may be uninformed about the risk of spreading of microbes when using the toilet and the subsequent surface contamination that may extend infection within the home, via simple contacts [14, 15]. In both male and female subjects this matter may result in transmission of infection. Some viruses could persist in the air even after toilet flushing and infection may be acquired after inhalation and swallowing [16]. Hence presence of more microbes in squat toilets compared with sitting toilets would also lead to a more rate of contact and air-borne infections.

Large numbers of bacteria and viruses when seeded into household toilets may remain in the bowl even after flushing, and even continual flushing could not remove a persistent fraction [11]. This was found to be due to the adsorption of the organisms to the porcelain surfaces of the bowl, with gradual elution occurring after each flush. Hence, there is also a possibility that a subject may get an infection from an aerosol created in a toilet that this matter may also be seen with a more magnitude in squat toilets [17, 18, 19].

Totally, according to our findings, it may be concluded that use of sitting toilets should be encouraged to reduce the rate of infection transmission and prevention of gastrointestinal, respiratory, and genital infectious diseases. Finally, it is recommended to perform further studies to obtain more definite results and the determining the contributing factors for transmission.

RESULTS

In this study in 12 out of 20 sitting toilets (60%) and 11 out of 20 squat toilets (55%), the toilets were placed in the bathroom ($P > 0.05$). In 18 out of 20 sitting toilets (90%) and 17 out of 20 squat toilets (85%), the toilets were placed in a location with windows opening to the outside ($P > 0.05$). All the sitting and squat toilets had good-working fans. A window with sunray exposure in the southern part of the toilet was available in 16 out of 20 sitting toilets (80%) and 17 out of 20 squat toilets (85%) ($P > 0.05$). The artificial light (lamp) was present in all the sitting and squat toilets.

The frequency and microorganisms was differed between two types of toilets (Table 1) and the sitting toilets had fewer microorganisms ($P > 0.05$). But the frequency of gastrointestinal and non-gastrointestinal germs was not significantly differed between squat and sitting toilets ($P > 0.05$).

Being placed in the bathroom, type and quality of fans in the toilets, having windows opening to the outside, and having window with sunray exposure in the southern part of the toilet had no effect on the positive results and type of microorganisms cultured in the bathroom ($P > 0.05$).

Table 1- Results of microbial culture in two types of toilets*

Culture result	Squat (20 toilets)	Sitting (20 toilets)
No growth	1 (5%)	7 (35%)
E-coli	7 (35%)	5 (25%)
Klebsiella pneumoniae	3 (15%)	1 (5%)
Pseudomonas aeruginosa	1 (5%)	1 (5%)
Entrobacter	2 (10%)	1 (5%)
Proteus mirabilis	2 (10%)	1 (5%)
Staphylococcus aureus	2 (10%)	2
Streptococcus	1 (5%)	1 (5%)
Entrococci	1 (5%)	1 (5%)

*There was a statistically significant difference between the presence of microorganisms in two types of toilets ($P < 0.05$); but the type of the germs was not differed ($P > 0.05$).

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