

ORIGINAL ARTICLE

## Conceptual Framework of Toilet Seats Design from Hygiene Perspective for the Society of the ‘Islamic Republic of Iran’

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### ABSTRACT

The human being is the noblest of all the creations by Allah Rabbul-Izzat. Allah gave special commands to humans which made differences over other species, the hygiene practice is one of them. The researches on toilets, defecation, urination and self-cleansing may be supposed as unthinkable subjects in daily discussions, but these topics are important for health and hygiene perspectives. Designers and manufacturers are busy making aesthetically attractive, ergonomically and anthropometrically defined toilet seats. But there is a need for some adjustments in the size and design of modern toilet seats as per the hygiene perspective. This paper presents a conceptual design framework aimed, increasing the level of hygiene and introduced the three-dimensional designs of sitting and squatting types of toilet seats with some amendments as compared to modern designs, concerning hygiene perspective. The present conceptual design of toilet seats can become the integration of human hygiene practice. In this study, Solidworks Designing Software was used for three-dimensional designs. This framework study dedicates to Iranian society.

**KEYWORDS:** Human Hygiene, Toilet Seats, Unhygienic Gap, Unhygienic Droplets, Conceptual Design

### INTRODUCTION

The design which accomplishes the social, cultural, and psychological needs of the society provides maximum benefits. In human daily life, whether at home or the workplace, the toilet is an important facility and its cleanliness and design are also important health considerations. According to World Health Organization guidelines on sanitation and health “Toilet design, construction, management, and use should ensure that users are safely separated from excreta” [1].

If there will be some amendments in modern toilet seat design as per hygiene perspective then, it can become more user-friendly.

The real problem was introduced when Muslim people complained about their cleanliness when they used the toilet. They complained that when urine/ cleansing water strikes the inner surface of the toilet seat then, some droplets reflect on their skin.

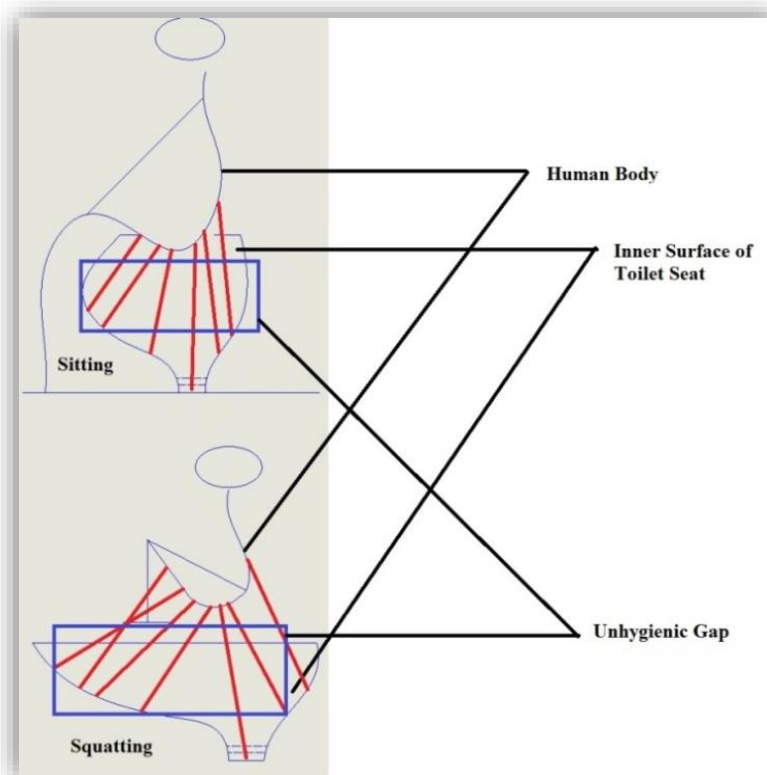
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After research and discussion, it has been found that in the modern toilet system the gap between the inner surface of a toilet seat and the human body was comparatively small as per the hygienic point of view. In this study, this gap was termed as an ‘unhygienic gap’. The simulation of human action in the toilet has been shown in Figure 1. Blue lines in Figure 1 show the distance between human body parts and the inner surface of a toilet seat. Therefore this conceptual design of the toilet seat came into consideration. Being an Islamic country this study dedicates to the society of the ‘Islamic Republic of Iran’.

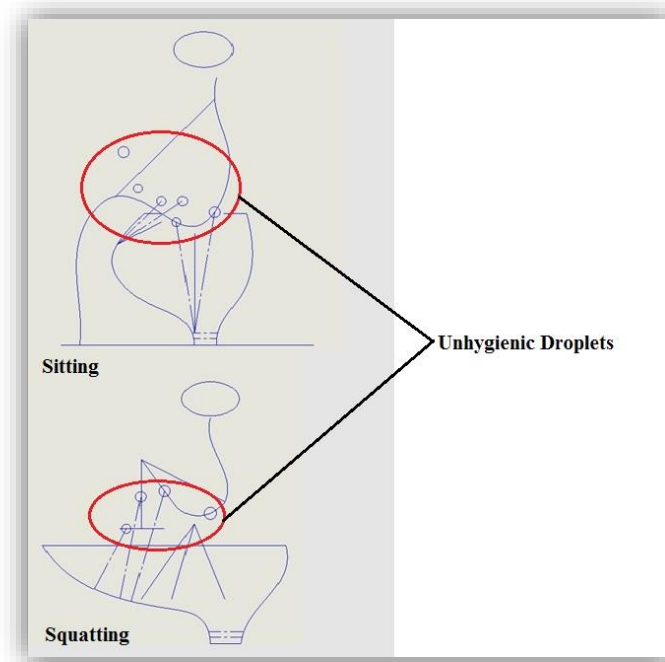
There are two types of toilets, sitting type and squatting type generally used by Iranian Society [2]. Scientifically squat has more advantages over commode seating like there is no contact of the toilet seat with the human body. And there is less risk of spreading diseases like urinary tract infection as compared to commode seating [3]. But in some cases like old age, patients, obese/ bulky person commode seat is mandatory. The main problem in both types of toilet seats (sitting and squat) is an unhygienic gap which is small in the existing style of toilet seats.



*Fig 1.* The simulation of human action

Sanitation of body parts after defecation/urination by water is principally a good hygiene practice and mostly performed by all Muslims. But due to the ‘unhygienic gap’ when urine and cleansing water strikes the inner surface of the toilet seat then, some

droplets reflect on the human body, sometimes it is ignored and causes to become body unhygienic and skin diseases. In this study these droplets are termed as ‘unhygienic droplets’, and this micro process diagrammatically as shown in Figure 2.



**Fig 2.** Micro analysis of 'unhygienic droplets' on human body

In the present study, the concept of maintaining unhygienic gap and keep the human body clean from unhygienic droplets were investigated and developed three-dimensional design of toilet seats (both sitting and squatting types) with the help of Solidworks Designing Software.

## MATERIAL AND METHODS

### *Design Methodology:*

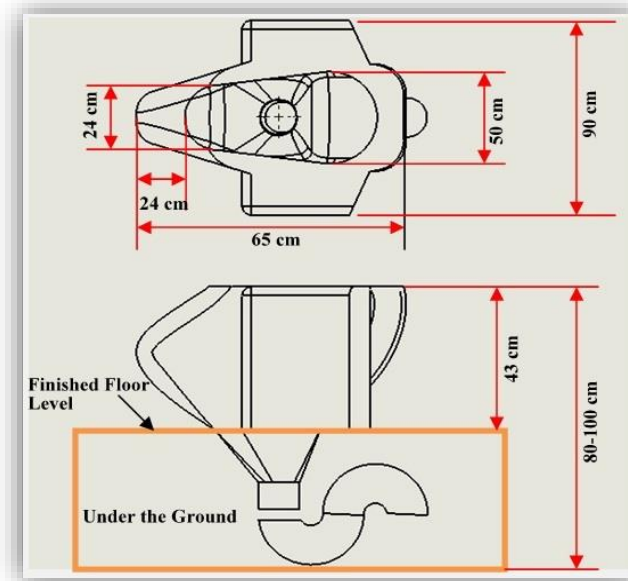
The present conceptual design study was based on the simulation and design methodology, the reference geometry dimensions (in centimetre) were used for the justification of three-dimensional designs as shown in Figure 3 and Figure 5.

For the generation of three-dimensional models of toilet seat (sitting and squatting) various geometrical features, reference dimensions, and anthropometries were considered from the observation and essential study of ancient and modern toilet seat designs [4-5].

The designs of toilet seat models in the present study of toilet seats (both sitting and squatting) were developed in Solidworks software.

### *Design of the Sitting Type Toilet Seat:*

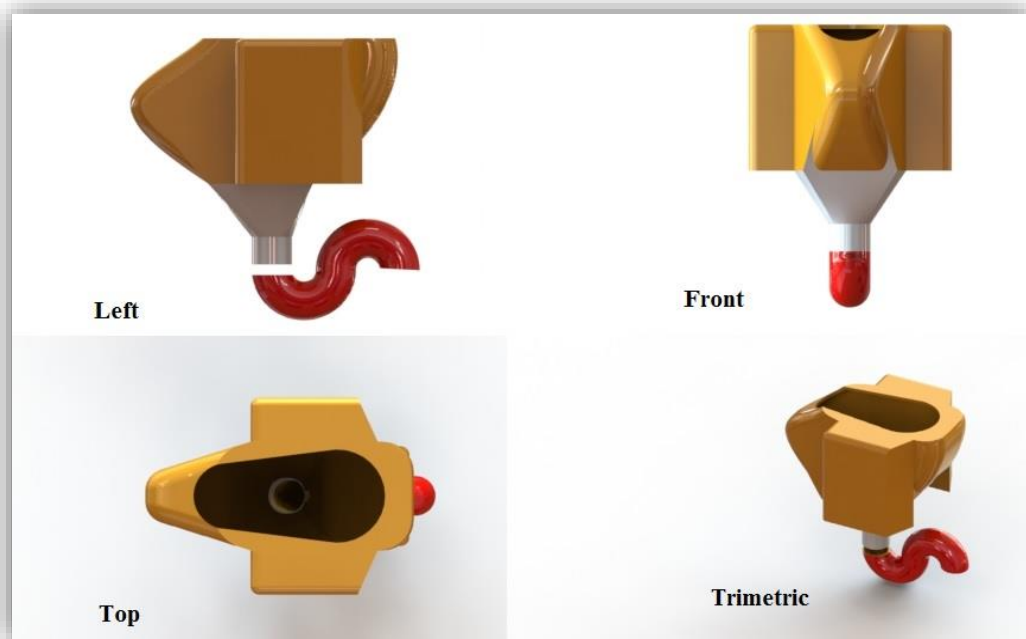
Reference geometry dimensions of sitting type toilet seat were described in two-dimensional drawing as shown in Figure 3.



*Fig. 3 Two-dimensional drawing of sitting type toilet seat*

In sitting type toilet seat generally 42-43 cm sitting height was used and the present design, sitting height was 43 cm but total height of toilet bowl increased by approximate 80-100 cm, i.e. height of toilet bowl above floor level was 43 cm as shown in Figure 3.

The three-dimensional design of sitting type toilet seat with four viewing angles (left view, front view, top view and trimetric view) was developed in Solidworks as shown in Figure 4.

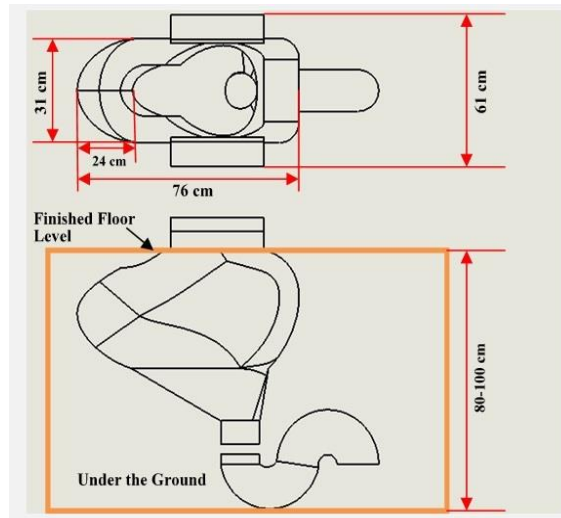


*Fig 4. Three-dimensional design of sitting type toilet seat*

**Design of the Squatting Type Toilet Seat:**

Reference geometry dimensions of the squatting type

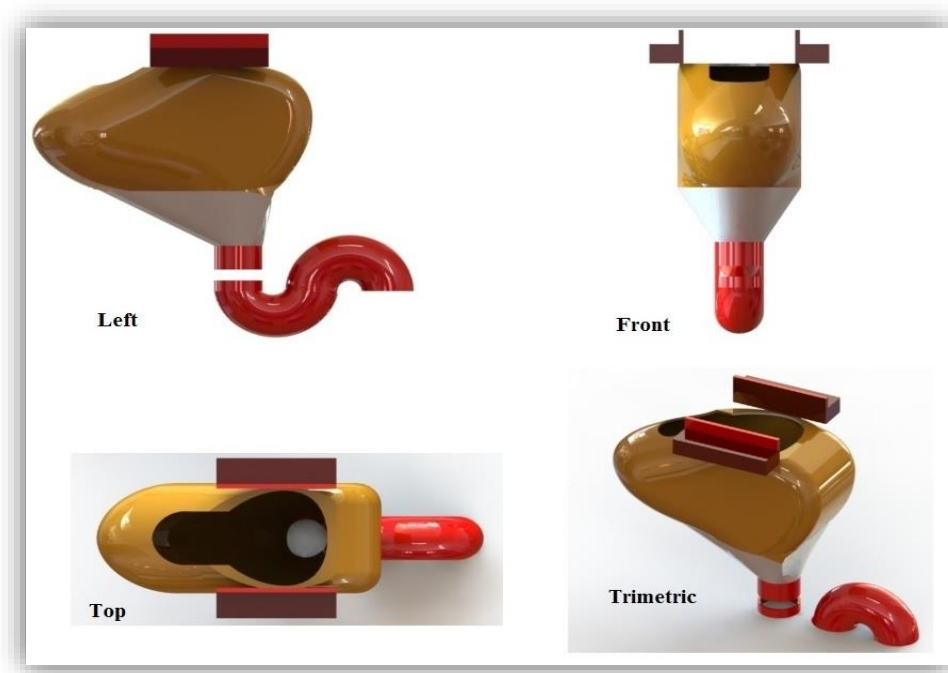
toilet seat were described in a two-dimensional drawing as shown in Figure 5.



**Fig 5.** Two-dimensional drawing of squatting type toilet seat

The three-dimensional design of a squatting type toilet seat with four viewing angles (left view, front view,

top view and trimetric view) has been shown in Figure 6.

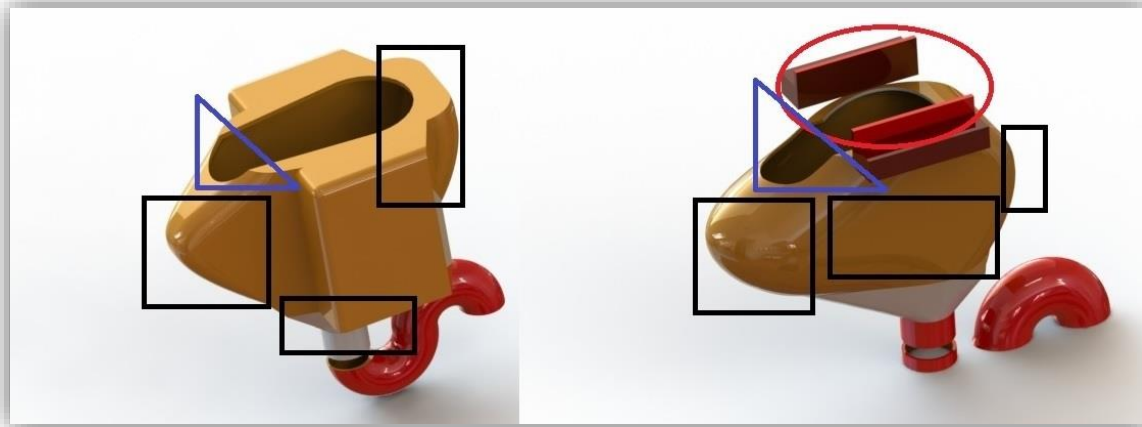


**Fig 6.** Three-dimensional design of squatting type toilet seat

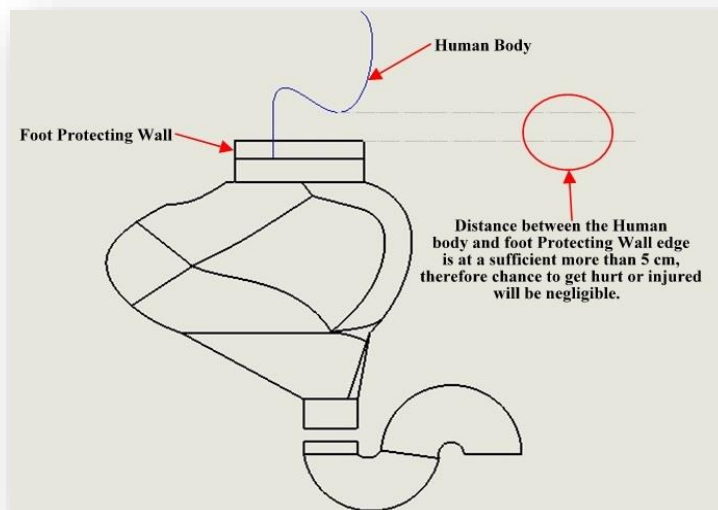
### *Amendments:*

The three-dimensional models of sitting and squatting type toilet seats are shown in Figure 7. Black rectangles denote the amendment in size (depth, height and length) and shape. The inclined cut at the front end of the seat was designed for the justification of the horizontal length of the toilet seat which has been shown by blue triangles in both types of the toilet seat

in Figure 7. In squatting type toilet seat foot protecting barrier/ wall from unhygienic droplets at both ends of footsteps also designed as shown in Figure 7 with a red circle. The height of foot protecting wall was not more than 4.5 cm therefore no chance to get the human body hurt, the complete simulation in 2D drawing as shown in Figure 8.



*Fig 7.* Amendments in sitting and squatting type toilet seats



*Fig 8.* Foot protecting wall in squatting type toilet seat

## RESULTS

Following design outcomes, as compared to modern toilet seats design have been found in this conceptual design study as shown in Table 1.

In this study, only the design process has been discussed the following investigations will be considered after manufacturing of said product design as shown in Table 2.

*Table 1.* Design outputs

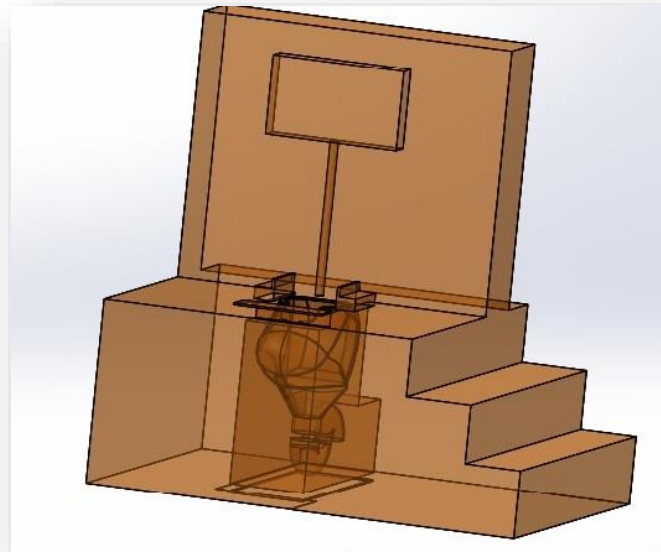
Investigation	Modern Design	Conceptual Design
<b>Unhygienic Gap</b>	Not Maintained at a hygienic level	Maintained at a hygienic level
<b>Unhygienic Droplets</b>	Can be placed on human body	Missing on human body
<b>Human Body Hygiene</b>	Partially	Fully

*Table 2.* Design outputs after manufacturing

Investigation	Present Design	Conceptual Design
<b>Installation</b>	Easy	Slight Difficult
<b>Installation cost</b>	Low	High
<b>Space Required</b>	Less	More

The proposed design will take more space as compared to the existing system but installation justification can solve the problem, for multistory buildings and apartments there can be an upward construction that can be used as shown in the Figure 9. It can be used in both types of seat arrangements.

The proposed toilet seat cleaning will be the same as the existing toilet seat while it will take more water, the same flush will be used. In the current scenario, there are various spraying-based toilet cleaners and long brushes are available for toilet seat cleaning.



*Fig 9.* Upward construction

## DISCUSSION AND CONCLUSION

This study was aimed to investigate the mismatch distance between the inner surface of a toilet seat and the human body. This study provided some adjustments in the size and shape of the toilet seat (in both sitting and squatting type) from hygiene point of view. These designed seats were considered for both male and female users. It has been observed in this conceptual design study that the risk of getting unhygienic at the time of toilet use can be reduced and improved human health level. Sometimes unhygienic body causes psychological disorders in humans. “Anxiety and depression, on the other hand, have been repeatedly shown to be associated with chronic pruritus skin diseases” [6].

The finding of this study was that there is a considerable mismatch distance between the inner surface of a toilet seat and the anthropometry in modern toilet seat designs. On the basis of this conceptual design study, it has been observed that the distance between the toilet seat and the human body has been maintained at the hygienic level and unhygienic droplets on body parts vanished during urination and self-cleansing.

## ACKNOWLEDGEMENT

The author would like to thank the people who have given their valuable suggestions directly and indirectly to design a better product. The author wishes his gratitude to his family.

## CONFLICTS OF INTEREST

It is justified by the author that the present conceptual design does not promote any Product/ the name of any Company.

No competing interests exist and no funding sources were used to write this article.

The author declares that there is no conflicts of interest.



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