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RESEARCH PAPER

Analytical Study of Ablution Spaces: Case Analysis of Mosques in Lahore, Pakistan

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ABSTRACT

The activity of performing ablution being a prerequisite for praying and reciting holy Quran has made ablution area an essential element of Mosque design. Its design has varied with the development of technology, new materials, cultural changes and wisdom of the designers or constructors and limitations of construction budget. Therefore, we find a variety of systems for ablution units in every mosque and prayer area during different times in different localities. The objective of research was to find most acceptable space dimension and design for the user's comfort while performing this activity. Survey of three selected mosques in Lahore showed that none of the systems was perfect by all means and in each case nature of problems and level of satisfaction varied at the end of users. On the basis of user's comments and physical observations, an analysis was carried out in terms of sizes and space dimensions of the ablution units designed by different architects in the three mosques of Lahore. Provision of different allied facilities that contribute to the satisfaction of users have also been studied. The results shows that the physical dimension of different elements of ablution units and user's level of satisfaction in all three mosques are same in some of the elements. The study provides a preliminary design guidelines for design of ablution unit in mosques. The effort is supposed to benefit the architects and student of architecture in designing ablution units for the mosques. In addition to that recommendations can be incorporated in local building byelaws concerning the mosque and prayer area design.

Keywords: Ablution, Design, Mosque, Prayer, Satisfactory, Survey, Users

Introduction

Performance of ablution (wudhu) prior to offering prayer at any time and place is a prerequisite. There are set rules to perform this function as stated in Quran, Hadith and practically demonstrated publicly by the Holy Prophet (peace be upon Him). For design purposes, the ablution function involves washing with clean water certain parts of the body in a certain order. It starts with washing the hands, rinsing the mouth, cleaning the nose by sniffing, washing the face, washing each arm up to the elbow, wiping the head with wet hands, rubbing the ears with wet hands, and finally, washing the feet up to the ankle . Whereas the rules or sequence of action for this activity is carried out in the same manner everywhere, the design of space or the facility to perform this function varied with time and place or even mosque to mosque. The variation as observed depends upon the level of facility, use of technology, availability of funds and choice of the people responsible for design and construction of this facility. Accordingly the level of perfection in design, comfort of the worshippers and suitability of the mechanism used varied everywhere.

Keeping in view the significance of ablution, there is a need to develop a standard design for this facility which is most appropriate to accommodate required function, in a

comfortable manner for everyone and more importantly fulfill the intended requirement in the best manner. Ablution space has the following essential elements to facilitate the worshippers for performing this activity

- Sufficient flow of clean water in gentle form
- Adequate sitting space for the individual with or without a seat.
- Proper drainage for the used water
- Place for hanging or placing personal belongings
- Soap for cleaning of hands
- Cleaning/drying facility for hands and face
- Non-skid floor

There could be some additional facilities depending upon the locality/ culture and affordability, like

- Temperature control of water
- Electric Drier or drying paper/towel
- Standing type unit fulfilling all the above stated requirements to facilitate people who have problem in sitting due to any reason.
- Looking mirror
- Partition between two units

Problems and issues

Because the ablution facilities are not constructed on basis of any standards or design principles, the users are generally experiencing unsatisfactory conditions in one or the other manner. Following problems are commonly confronted:

- The flow of water from the tap/ faucet has high or low pressure
- The type or design of faucet (water tap) is such that it creates splashes making a person wet unnecessarily.
- The size and height of the sitting pedestal (seat) is either very low or very high.
- The distance between seat and water tap is not adequate.
- The height of water tap is not adequate according to seat height and not in conformation to anthropometric dimensions.
- The design of drain for the waste water is not appropriate in terms of its depth, width and shape causing splashes of water on clothes/body and inefficient and unhygienic flow of waste water.
- Insufficient space between two persons performing ablution which results in disturbance to each other and splashes created by one affect the other.
- No provision of soap dish and clothes/ belongings hanging facility.
- Slippery floor finishes
- No facility for drying the washed body parts
- No partitions between two worshippers causing a person to suffer from the nuisance created by the next person.

Literature Review

The mosque is considered as one of the most important buildings in the Muslim world (Malik et al., 2019). Mosques are built as a place where people can always worship Allah Almighty, and as an environment that meets the needs of believers and educates the future generation on the verses of the Qur'an and the teachings of the Prophet. Performance

of ablution (wudhu) prior to offering prayer at any time and place is a prerequisite. The space provided for purification is included in all mosque designs named as ablution space.

According to Sukadarin (2021), a well-designed ablution area is one of the most important elements to be considered in the infrastructure of mosques and other praying facilities but some mosques have inadequate ablution space. The objectives of the research were to investigate the discrepancy between the design of the existing ablution spaces and the anthropometric measurements of the Malaysians, to determine the users' satisfaction with the design of the existing ablution areas and to suggest improvements to the existing ablution areas based on appropriate anthropometric measurements and ergonomic aspects. A quantitative study approach was chosen. The existing ablution design was observed and measured for comparison with the corresponding anthropometric data. The users' satisfaction level was also collected. As a result, design 2 for both men and women has acceptable ergonomic features and dimensions compared to design 1. Therefore, this design is preferred by the HEI, Higher Learning Institute users compared to design 1. (Sukadarin et al. 2021).

Material and Methods

The methodology adopted for the current research was based on the analytical study of existing ablution facilities, formal interviews of worshippers and anthropometric analysis of ablution units. To figure out how people experience ablution units while using this facility, different representative mosque were selected as case study from different residential areas under developmental authorities like LDA, DHA and Bahria town in Lahore. For this purpose questionnaire forms were distributed to worshipers in selected mosques and their response was recorded. Findings and other support information was analyzed which helped in making a comparison of ablution unit in realizing the difficulties in terms of its design and provision of allied facilities. The data collected also showed the level of satisfaction of users and their suggestions for improvement. Measurements of each element in all ablution units were taken to compare the sizes and dimensions of ablution units in the selected mosques.

Table 1
Comparison of Different Ablution Designs for Male and Female

No	Description	Ablution Dimension(cm)	Anthropometry Dimension(cm)
	Design 1(Male)		
1	Tap Height	45	120
2	Tap to user distance	35	70.5
3	Ablution point to point distance	58	96.3
4	Drain width	30	28-32
5	Floor elevation	19	13-20
6	Foot width	40	26.9
	Design 2(Male)		
1	Tap Height	76	120
2	Tap to user distance	40	70.5
3	Ablution point to point distance	98	96.3
4	Drain width	9	28-32
5	Floor elevation	14	13-20
6	Foot width	28	26.9
	Design 1(Female)		
1	Tap Height	48	120

2	Tap to user distance	35	70.5
3	Ablution point to point distance	65	96.3
4	Drain width	32	28-32
5	Floor elevation	20	13-20
6	Foot width	40.9	26.9
	Design 2(Female)		
1	Tap Height	66.4	120
2	Tap to user distance	40	70.5
3	Ablution point to point distance	67	96.3
4	Drain width	28	28-32
5	Floor elevation	13	13-20
6	Foot width	47.5	26.9

(Source: Sukadarin et al. 2021)

According to Utaberta & Shakir (2021), the design of ablution spaces in Malaysian mosques faces a major problem with respect to cleanliness. Although the ablution area has been designed to meet the needs of Muslims in performing ablution, several problems have been identified in relation to its design. The research was conducted in five Iconic Mosques of Malaysia to examine that how design of ablution areas affect the cleanliness of their users. Three research methods used were: physical observation, analysis of architectural drawings and interviews. The ablution design, ventilation, cleaning conditions and user experiences were discussed. The study revealed that large mosques in Malaysia suffer from serious hygiene problems resulting from many aspects including poor design, ventilation systems and misuse by users. The study suggested some recommendations for the design of future and existing ablution spaces to improve cleanliness. (Utaberta & Shakir, 2021)

Abdul Rehman studied the physical performance and safety condition of selected Malaysian mosques in Kuala Lumpur and Selangor. Direct observation was carried out in 15 selected mosques to investigate the design aspects ablution areas, focusing on ergonomics, usability and safety aspects. The study found that most mosques equipped with adequate seat size and tap location. However, most mosques have ablution areas with inadequate distance between seats and faucet height. In addition, the design does not take into account the needs of people with disabilities. This study recommends improving the platforms and washing facilities to make them more user-friendly with ergonomic design and safety features that ensure sleekness of cleaning activity. (Abdul Rahman et al., 2018)

According to Mokhtar (2005), there are several ways to design ablution units. Model 1 shows ablution with a seat. Most mosques in Pakistan have adopted this model for their ablution spaces while not considering the height of the seat, the drainage system and the shelf space. Model 2 - Unit with lavatory very similar to the design that is used in domestic bathroom. Users must bend down to reach the faucet and raise their feet to perform the final step of ablution. Model 3 shows the raised faucet level. This design is recommended because users must stand during the washing process. The height of the faucet is quite high to minimize bending during washing. The barrier is placed at knee height to provide comfort for users to raise feet and wash them from the faucet. A shelf, similar to models 1 and 2, is provided for the user's comfort. Model 4 is the simplest version with shelf on which the user can place his belongings and which helps him to balance his body by holding on to the Shelves. All models are equipped with non-slip tiles that provide safety and comfort during ablution (Mokhtar, 2005).

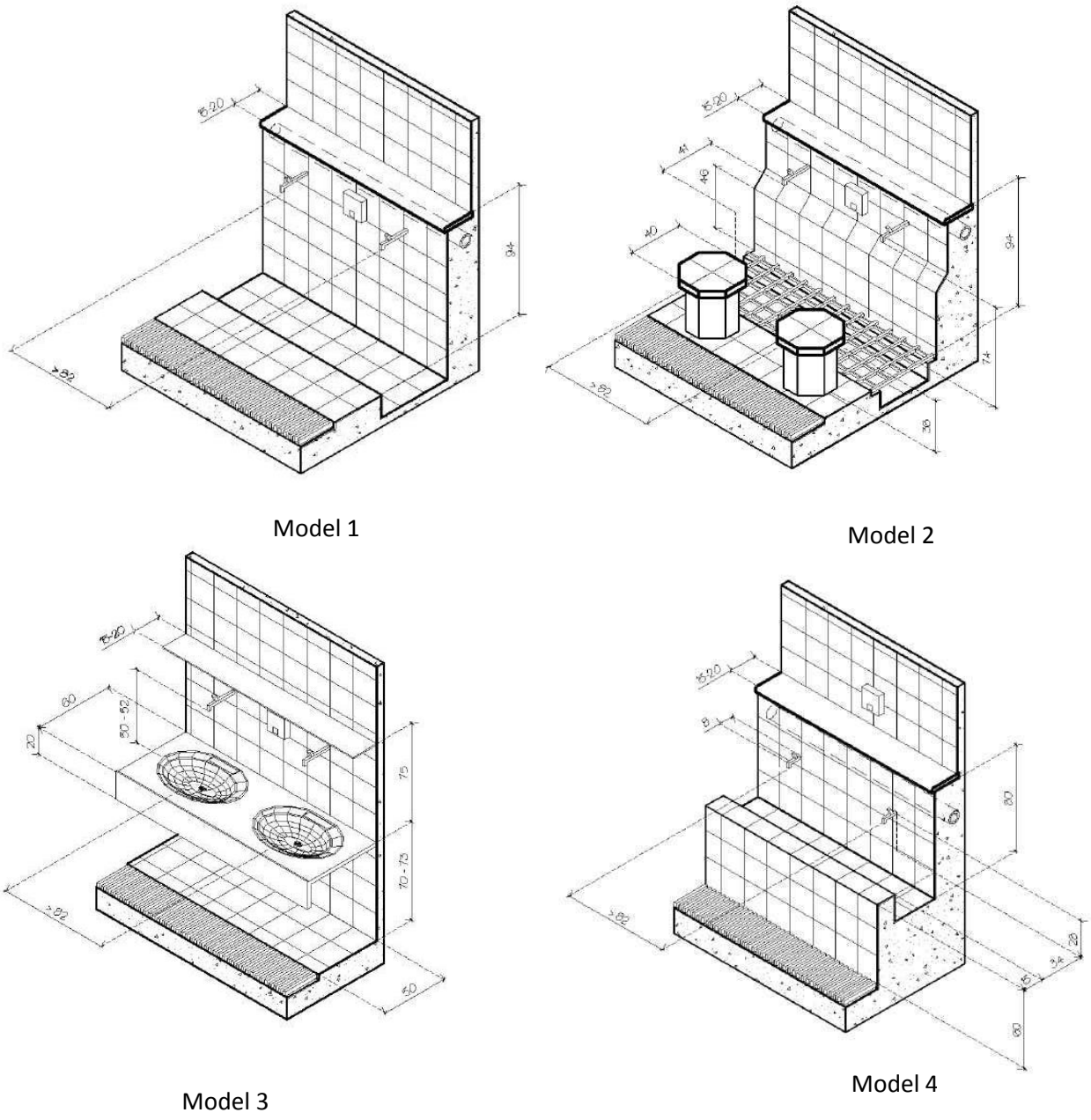


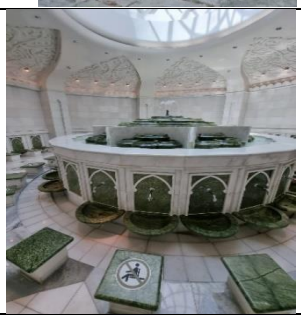
Figure 1: Different Models of Ablution Units (Source: Mokhtar, 2005)

Table 2: **Comparison of Different Ablution Types form**

Ablution Type	Comments
Pool Type	
	The most simple and common ablution arrangement used in historical mosques built during Mughal Era like Wazir Khan Mosque and Badshahi Mosque. A central water pool, usually in the center of courtyard was provided with sitting spaces all around the pool. A drain along the outer edge of pool used to drain the used water.
Fountain Type	

A developed form of ablution in the form of a fountain with provision of taps for each individual all around.

Hagia Sophia Mosque, Istanbul has water storage in an octagonal form of tank with water taps all around.



Mosque, in Dubai, also known as Sultan Mosque has ablution fountain.

Contemporary Ablution Area

Tap water facility with a seat and provision for hanging clothes or other belongings.

Contemporary Ablution facility in Mosque of Iran is shown in image.

Tap water facility with a low level of seat and in circular shape.

Ablution unit in Faisal Mosque has slightly higher level seats and very shallow drain. Feet rest on floor almost at same level of drain

Modern Ablution

Innovative models for a composite design of seat and washing area for face as well as feet provided in some mosques of Dubai.

Ablution System in standing position. Ablution unit is divided into two parts.

Mosques Selected for Analysis

Grand Mosque, Bahria Town, Lahore

Grand Mosque is located in Bahria town, Lahore, Pakistan. It is ranked as third largest mosque in Pakistan and fourteen largest in the world. The mosque has area of 99,420 sq. ft. with a 70, 000 worshippers capacity. The architecture is influenced by historical use of domes.

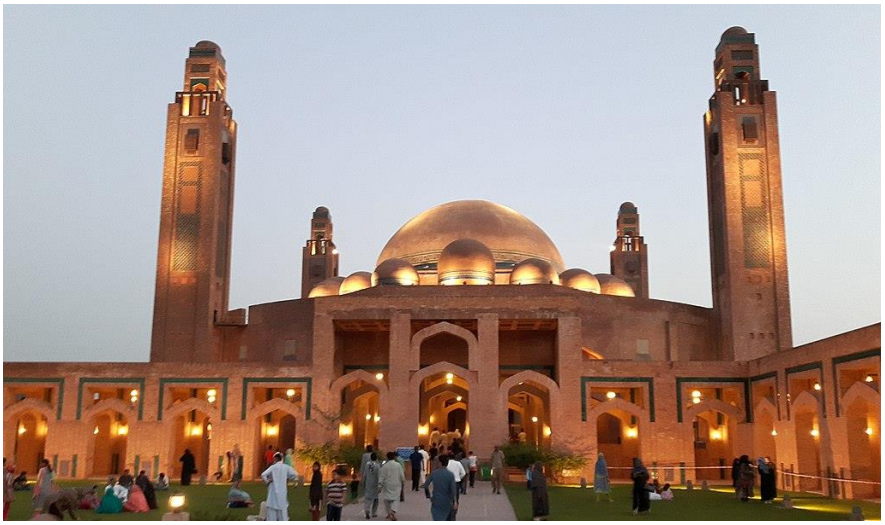


Figure 2: Grand Mosque, Bahria Town, Lahore.

Figure 3: View of Ablution Area of Bahria Grand, Mosque (Source: Author)

Allah –o-Akbar Mosque, DHA, Lahore

The mosque is located on a busy square opposite to the commercial area of DHA Phase I. Total Area of mosque is approximately 15 kanal with 2000 worshippers capacity. The hall of the mosque is rectangular in plan and the structure has no domes.

Figure 4: View of Allah-o-Akbar Mosque, D.H.A, Lahore.

Figure 5: View of Ablution Unit Allah-o-Akbar, Mosque

UMT Mosque, Johar Town, Lahore

University of Management and Technology, UMT is located in C2, Johar Town Lahore. UMT mosque has a capacity 2000 persons on ground and first floor.

Figure 6: View of UMT Mosque, Johar Town Lahore (Source: umt.edu.pk)

Figure 7: Ablution Area, UMT, Mosque Source: Author

Results and Discussion

Evaluation of ablution units and user satisfaction survey was done from the selected mosques DHA Allah-O Akbar Mosque, Bahria Town Grand Mosque and University Of Management And Technology Mosque (Johar Town) within Lahore. These mosques have been designed by renowned architects and are constructed properly with good materials.

A total of 60 respondents of different age group were approached in three mosques. It was observed that the maximum number of respondents were male as they regularly visit mosques. They included elderly, young and female as well. Data collected in terms of space dimensions and measurements of ablution units in each mosque is shown in Table 2. Sectional diagrams showing dimensions of each component are also shown in Figure 8, 9 and 10

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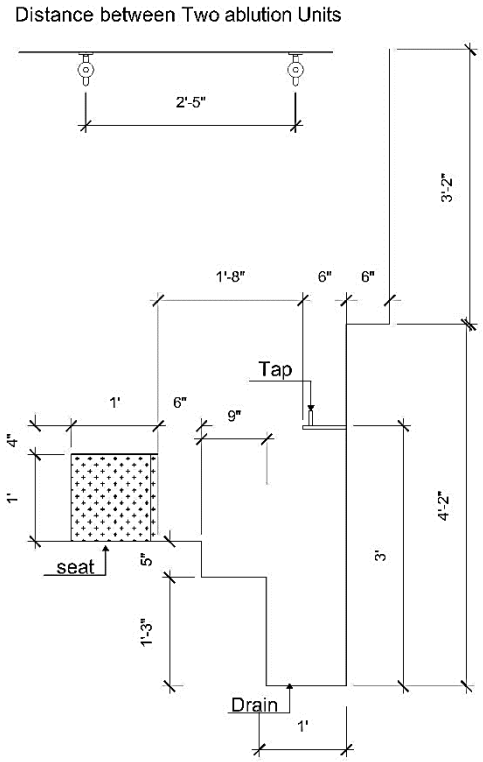

Figure 8: Sectional Details of Bahria Grand Mosque

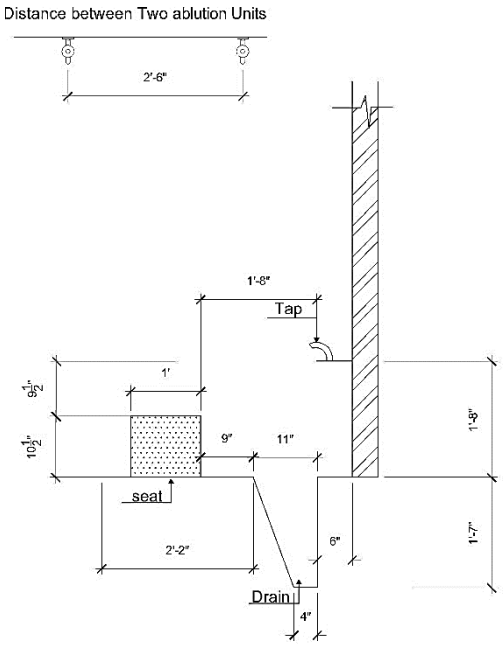

Figure 9: Section Details of Allah o Akbar Mosque

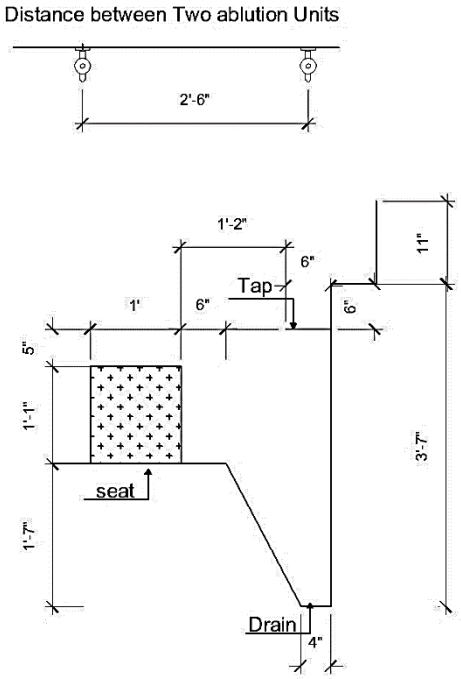

Figure 10: Sectional Details of UMT Mosque

For evaluation, the questionnaires were distributed to 20 individuals at each mosque who were briefed about the purpose of research. The survey form consisted of two types of survey.

(a) A visual observation by the surveyor regarding availability, provision of certain facilities like hanging hooks for clothes/belongings etc., soap tray, hand dryer, Paper towel, looking mirror and non-skid flooring.

(b) Response of the users about seat, water tap, drainage system, handrail, partition and cleanliness of ablution area.

The results from the survey (b) highlighted the problems of users and their opinion about different elements of the ablution units.

Table no 3
Actual measurements of the Mosques provisions.

S. No.	Parameters	Allah-O Akbar Mosque (DHA)	Bahria Town Grand Mosque	University Of Management And Technology Mosque (Johar Town)
1.	Ablution seat height?	11”	12”	11”
2.	Ablution seat width	12”	12”	12’
3	Distance between two ablution units	30”	29”	30”
4	Height of tap with reference to ablution seat?	5”	4”	9”
5.	Distance between two ablution units	30”	29”	30”
6.	Tap distance from the ablution seat?	19”	20”	20”
7.	Tap type	Manual	Manual	Manual
8.	Width of Drain for waste water	14”	12’	11”
9	Depth of drain from floor level	19”	20”	19”
10	Height of hanging clamp	No	84”	84”
11	Availability of Dryer, drying paper/towel	No	No	No
12.	Hand rail height	No	No	No
13	The floor covering material	Marble	Tile	Tile
14	Cleanliness	Good	Good	Good

* (All measurements are in inches.)

Seat for ablution unit

Respondents were asked to provide their opinion about the level of comfort while using seat for ablution. As the comparison chart shows for three mosques where seats have been provided for ablution, majority’s response (70%-75%) was positive. Comfort level was almost same at the three mosques concerning the seat height. Seat width of 12” was also acceptable and comfortable in all the mosques.

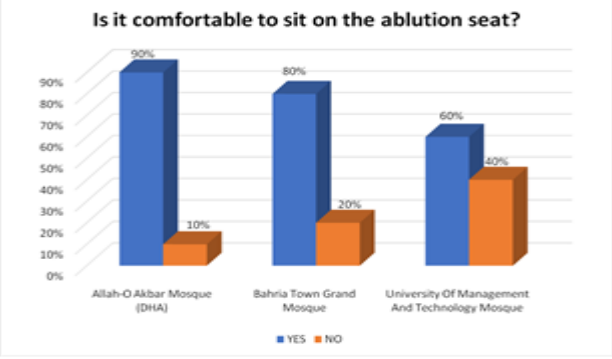

Figure 11: User analysis on Comfort ability of seat

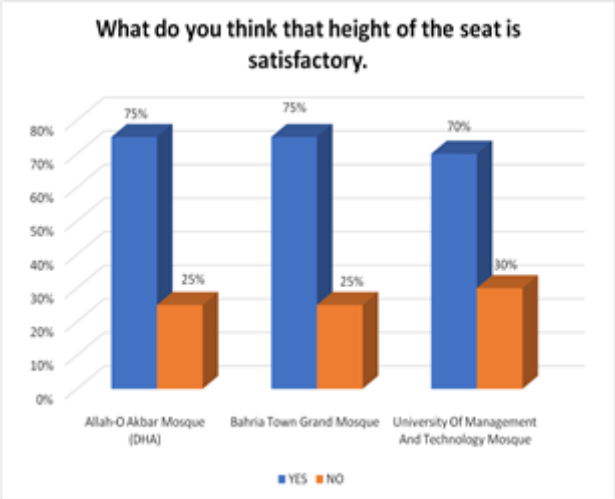

Figure 12: User analysis on Seat Height satisfaction level

Water tap placement

Water tap providing clean water for ablution is the most fundamental component of the ablution unit. The height of water tap has physical impact on the users due to bending their waist besides making clothes wet because of creating more splashes if not appropriate. A comparison of height of water tap is shown in figure 3 and 4 for the mosques. In response to suitability of tap height majority (80%-100%) of the users were satisfied with the provided height of water tap at ALLAH-U- AKBAR and Bahria town mosque. In other words lesser distance of 4”-5”was more comfortable as compared to 9”at UMT mosque.

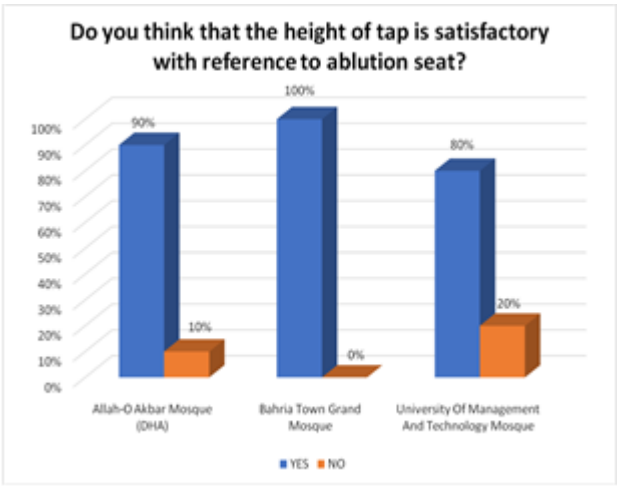

Figure 13: User analysis on Height of tap

Tap distance from the seat

However the distance of tap from the seat is equally important for the comfort of user to avoid any physical strain and getting clothes wet while performing the ablution. Although the distance of tap from seat was almost same (19”-21”) in all mosques. However level of satisfaction was highest at Bahria Grand Mosque and lesser at UMT.

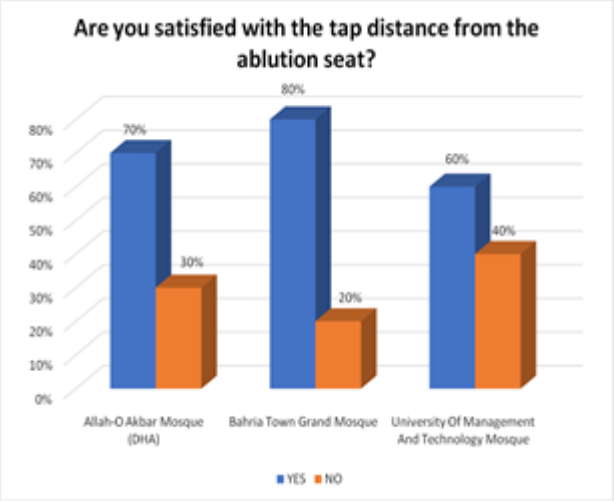

Figure 14: User analysis on tap Distance

The type of water tap, its design, its operating system and the pressure flow of water also matters besides the height and distance. In this regard to respondents were very satisfied at all the three mosques as shown in figure 15.

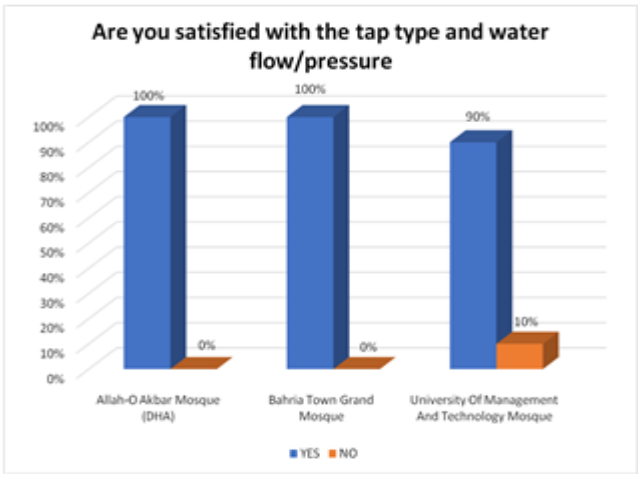

Figure 15: User analysis on tap type and water flow

It has been observed that certain taps have a filter device fixed inside at the outflow point which changes the thrust of water flow to softness. Such provision is helpful in reducing the splashes created from pressure of water from tap. Magnetic water taps are helpful to save the usage of water. However being costly none of the mosques had provision of such taps.

Water drainage system and design

The shape, depth and width of the drain below water taps is also very important and plays considerable role regarding comfortable feeling for users. Its wrong design in terms of its shape, depth and width will create problem for the users not only in physical terms but also in creating more splashes and aesthetical nuisance for the users. Worshippers were asked about the splashes of water due to design of tap and drain. The response of the users show that 70% were satisfied with the shape and size of drain at Bahria mosque in terms of less splashes from the drain walls. As shown in figure 6 the shape of drain at Bahria is different from the other two mosques. Level of satisfaction at other two mosques is almost same as the shape of drain is same in two mosques. However depth of 20" and width of 12" is considered appropriate as per survey results

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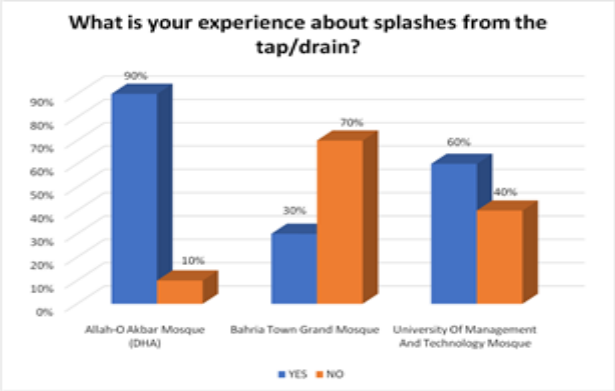

Figure 16: User analysis on splashes from tap

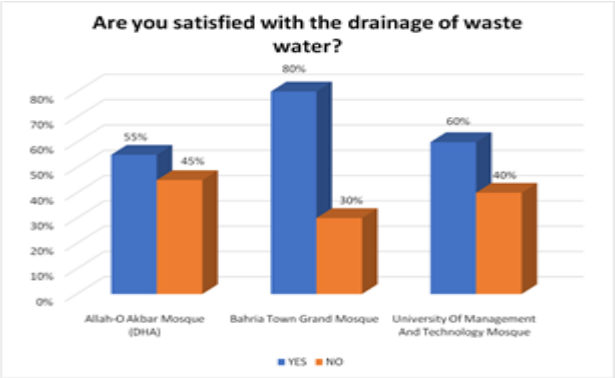

Figure 17: User analysis on drainage of waste water

As stated above the drainage of water from an ablution unit is very important to maintain cleanliness and avoid any aesthetical nuisance for users because of the waste flowing from other users. The survey shows that 80% users were most satisfied at Bahria Mosque and least 55% at Allah-O-Akbar Mosque DHA. It has been observed at certain mosques that a layer of perforated metal sheet (grill) is placed little above the bottom level of the drain. Due to this the flow of waste of any user is not visible to other users because it will flow in the drain under metal grill.

Handrail

No provision of proper handrail was available at any of the mosques which is mostly need for the elderly people for the safety from slippery floor.

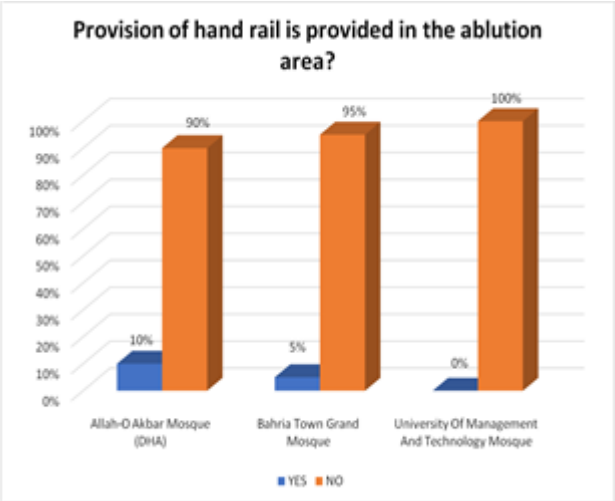

Figure 18: User analysis on provision of handrail

Allied facilities

Provision of soap facility was available at three mosques. Soap for washing hands was adequately available at Allah-o-Akbar and UMT mosque i.e. 60% and unsatisfactory at Bahria mosque i.e. 30%. The results show that none of the mosques had any provision for hand drying. Bahria Grand mosque had better facility for hanging clothes/ belongings and Allah-o- Akbar had almost no facility for this purpose.

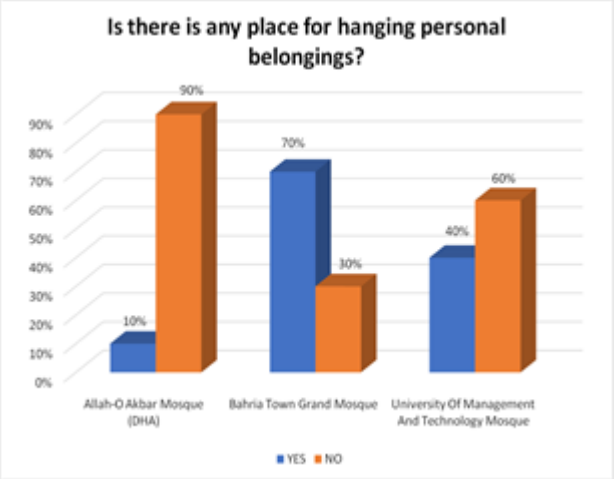

Figure 19: User analysis on hanging facility

Figure 20: User analysis on availability of soap

Looking mirror is although not an essential part of the ablution unit but its provision can help people in checking proper conditions of the face and hairs after ablution. A very limited facility was provided at Bahria mosque whereas the other two have no such thing. Sometime people are unable to do the ablution in seated facility due to the type of dress they are wearing or some physical problem. They feel easy and comfortable to perform ablution on wash hand basins while standing. Therefore some provision of certain such units is appreciable in a mosque. Limited provision was found at Bahria Grand mosque while the other two had no such provision.

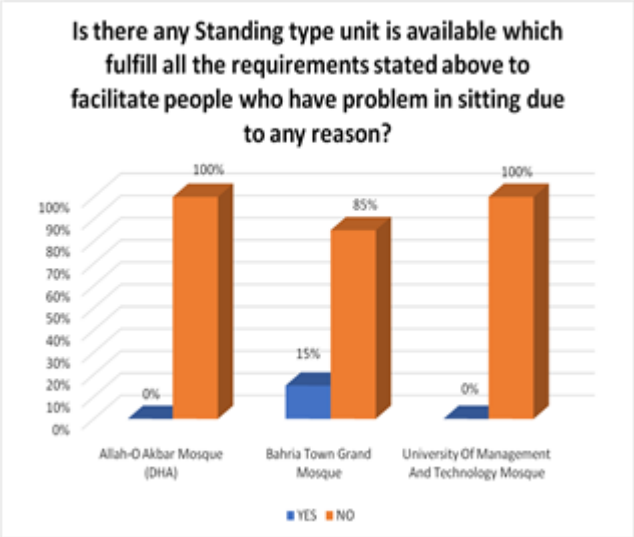

Figure 21: User analysis on Wash basins

Floor finish covering

Floor covering in ablution area is very important to avoid slippery conditions due to wet floor .It is very dangerous if someone elderly slips and falls down. Therefore some kind of non-skidding flooring must be laid in ablution area.

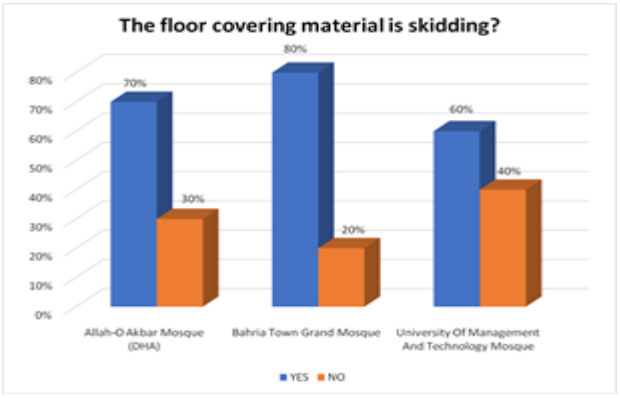

Figure 22: User analysis on floor covering

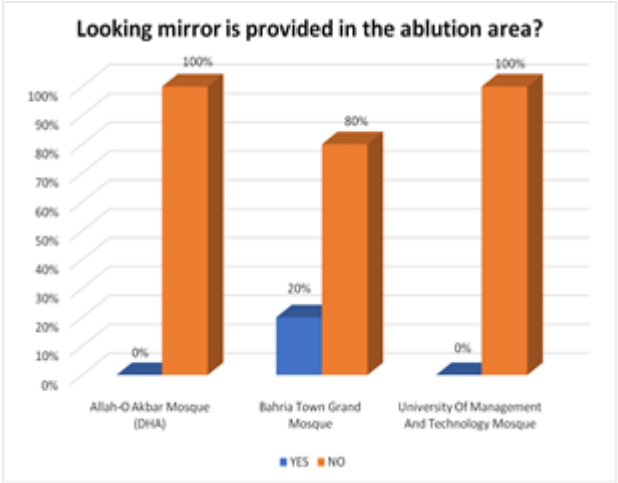

Figure 23: User analysis on provision of looking mirror

Survey shows that all the three mosques were a bit ignorant about this problem. Satisfactory level (40%) was observed at UMT mosque while only 20%-30% at the other two mosques.

Cleanliness

Cleanliness in ablution area is very important and a mandatory obligation when someone is preparing him or herself for prayer. Best cleanliness level was found at UMT mosque and 95% respondents verified it whereas the percentage drops to 50% in case of Bahria grand Mosque.

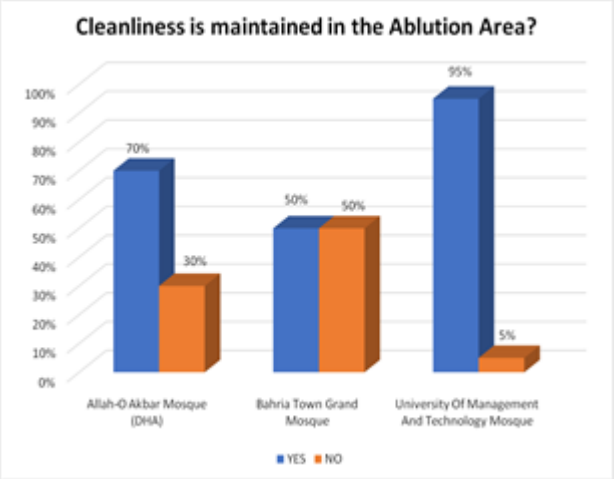

Figure 24: User analysis on cleanliness

Distance between seats

Distance of 2'6" between two seats was almost same in all mosques and adequate. No user had any complaint about that. Partition between two ablution spaces was also considered helpful to avoid splashes of water created due to other side by user. However it's not common or seen in any mosque. The majority of users did not respond positive about this provision.

Conclusions and recommendations

Study of co-relation of physical dimension of different elements of ablution units and user's level of satisfaction in all three mosques shows that, there are many similarities in some of the elements e.g. a seat of 12" width and 11" is necessary, adequate and acceptable in all mosques. Distance between two seats of 2'6" is also standard and adequate. The height of tap water from seat is preferred as 4"-5" in two mosques and considered satisfactory. However distance of tap water from seat was almost same (20") in all mosques and considered comfortable. It is recommended that the water tap should have some filter device at the outlet point which converts water flow in soft form (foam like), which will help in reducing the splashes on clothes. It is also recommended that magnetic taps should be used to save the water usage and avoid wastage. Drainage has a significant role in ablution unit design as it can increase or reduce the splashes created by the drain walls. The results show that a depth of 20" and width of 12" of the drain with straight walls as found in Bahria Grand Mosque is adequate rather than tapered wall on one side as found in two mosques.

Allied facilities like soaps, hanging hooks and hand dryer add to the convenience and comfort of the users. Therefore it is recommended that such facilities must be provided adequately. Non -skidding floor finishes or floor covering is very necessary in ablution area

as wet floor can always cause injuries to the users due to skidding. Provision of metal grill in the lower part of the drain can help in cleanliness and better psychological feeling of users if designed properly. It is expected that ablution units designed on the basis of these recommendations will be more comfortable for the users and can become a standard design for future references for mosque design.

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