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RESEARCH ARTICLE
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REFORM PRIMARY HEALTHCARE CRITICAL ENVIRONMENTAL NEEDS: AN EVALUATION OF BASIC HEALTH UNITS IN BARKHAN, BALOCHISTAN

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ABSTRACT
Environmental considerations in the design of Basic Health Units (BHU) is very significant to user optimum usage. Rural areas in Pakistan are faced with major environmental design and consideration challenges in the only available facility in form of BHU. Environmental considerations as temperature, humidity, cross ventilation, natural lighting, heating and cooling systems, developing human comfort are critical for BHU. BHU environmental considerations have not been explored in the rural context of Pakistan, hence research was taken forward. The research explored selected environmental variables satisfaction level amongst end users in three BHU of Barkhan city, Balochistan Pakistan. Research approach evolved through review of literature followed by an observational checklist and a questionnaire for end users data collection. 25 users from each BHU were selected including service seekers and service providers. Total of 75 respondents was used as sample size with purposive sampling method. Data was collected in both summer and winter seasons. Major gaps were observed. Only 35% were satisfied with functionality of BHU,33% were satisfied with insulation and thermal comfort aspects, 31% with HVAC was mainly missing and only exhaust fans and ceiling fans were provided, 35% were satisfied with indoor temperature control, 58% were satisfied with natural day lighting, there was complete lack of landscape or provision of any horticulture, 40% were satisfied with indoor finishes and most of the respondents failed to critically appreciate the BHU as a facility apart from emergency cases. Hence a holistic approach to environmental design of BHU in explored context is proposed.

Keywords: Basic Health Unit (BHU), Environmental Design, End user satisfaction, Rural Pakistan, Barkhan Balochistan.

INTRODUCTION
Healthcare is a basic need of human life. It is necessary for mankind to survive. It helps the people to live healthy lives. People need health facilities so that can seek guidance and help in times of sickness and illness (1). These spaces are very critical to public since they help people overcome

their diseases and medical illness. If these spaces are not part of the system, people will not be able to seek guidance in times of hardship and diseases (2).

Basic health units are the most important component of the healthcare system. They become the first line of action and point of contact for public to seek help in times of illness. These units have a very important role to play in the betterment and upliftment of the society. They act as the first line of defense and point of referral for public to seek further guidance help from higher institutions like clinics and hospitals (3). Lack of basic health unit is a serious threat to the public in any urban, sub-urban or rural area (4). Their role is to welcome, identify, observe, examine, provide first care referral and medication, first aid and medication and later developing history of patient to be later send to next line of healthcare components in the whole system (5).

Environmental considerations in the design of Basic health units is very significant to user optimum usage and helping the people to get best facilitation. People who provide services include doctors, medical staff, administration and support staff. People who come there to seek medical help are patients, their relatives, attendants, visitors, etc and they are all men, women and children and can also be of any age (6). Their medical condition might be very poor. Lack of consideration of environmental design in basic health care unit can have strong negative impacts on all of these people and can also create issues for people to provide help as well as seek help (7). Environmental aspects as temperature, humidity, cross ventilation, natural lighting, heating and cooling systems, developing human comfort are very important for basic health units and must be considered in designing of these buildings (8).

Pakistan is a developing country in South Asia with a large population that live under the line of poverty and lacks access to healthcare facilities. In Pakistan, there is approximately one doctor for 2000 patients and one nurse for 2400 patients as per World Health Organization 2015. As a result, there is a lot of population that have very poor access to the healthcare facilities. In such scenarios, basic health units acts as first line of action to receive medical help and seek guidance. If these facilities lack environmental considerations they will not be able to help people working in them and people seeking medical care. Balochistan is Pakistan's largest province with respect to area. Due to higher poverty, poor social and economic conditions, lack of medical facilities and staff, people are unable to avail these services. Basic health units here are considered blessings of God since they most of the time are the only source of medication available to the local community (9). Barkhan is a district in Balochistan with an approximate population of 30000-40000 people. Healthcare facilities are very limited and scarce. As a result, basic health units are the only major facilitation available in the local context. There are seven BHU in the local vicinity of Barkhan. The existing design followed in these units was not based on the local context and climatic conditions. Hence it was observed that it lacked the satisfaction of the people working in it.

Hence it was need of the hour to document these issues through research exploration and propose design solutions that could help people working in these units, the local community and public to avail these facilities through better design intervention. Exploration focused on three different units in different locations to do environmental evaluation. Keeping inline with research, three major research objectives were set forth:

1. To document the existing basic health units and baseline the issues through observational study in selected three units.
2. To evaluate environmental issues through users participation towards environmental aspects of thermal comfort, air quality, lighting, noise and overall cleanliness for user satisfaction.
3. To explore the design solutions and propose how these issues could be addressed in selected three basic health units.

Basic health units play a very important role in the lives of people. They help to reach medical facility and attention as the first point of reference. They must be designed with reference to the local context. The existing research explored the typical design of basic health units to evaluate its design reference to the local context of Barkhan and how it can be improved. It can serve as a

guideline for similar units in other locations to help improve them from environmental and end user satisfaction perspective for making these facilities sustainable and climate responsive.

MSDS (Minimum Service Delivery Standard, 2008) has indicated that Basic Health Unit, BHU is the basic facilities available to the community. Thus, their main purpose is to meet Outpatient, basic inpatient, referral and Preventive care need of the population. Health services offered at BHU are promotional, inhibitive, curative and referring. Outreach/community based services being a part of the package offered by the BHU (10). Basic Medical and Surgical consists of Inpatient and outdoor services, Malaria and Tuberculosis, Communicable disease control and Acute respiratory infections are other integrated services provided by BHU which complements Public Heath services. Mother & Child health related services are also there among the services which are included in the service delivery package offered at BHU (11).

First level referred facility to patients referred by LHWs is provided at BHU. As and when the need arises in the course of managing patients, BHU refers them to other facilities of higher calling. The BHU also serves to support clinically, logistically, as well as managerially the LHWs at their designated areas. It also occupies a central position to solving problems of health as evidenced in community and the public sector health functionaries (12).

Whereas for a BHU to be functional and expandable, it again requires 45000 Square feet of land to be dedicated for the purpose. Block of services forms the commercial area and the blocks of residence form the residential area. Service area having the covered area 2263 square units. The different segments of the building include an office and a private consulting room for the doctor, a room for the LHV (Lady Health Visitor), a health education room, reception area, dispensary, a labour room, a small laboratory area, two maternity beds, store for the vaccines, store for other stock and generator room. Residential block thus contains doctors', paramedics', and other caring and supporting staff members' houses (13). Boundary wall and approach road have to be available and the essential amenities of living such as water supply, sewerage, electricity, telephone and gas connection etc. BHU level some general emergency services should be there. BHUs should have proper channel through which patients are referred and transported to the higher facility.

The problems that have continued to challenge the Healthcare System in Pakistan include; inadequacy of resources, inequality, lack of and inadequate human resource, management disposition and lack of gender sensitivity (14). Health system has been developed by politicians while it has been given a face by health professionals on the field (15). The state regarding accessibility and affordability of the health services for receiving the facilities especially for the rural populace of the country remains a severe problem because of the scarcity of health workforce and pitiable share of resources allocated to the sector of Primary Healthcare or Pdssp (16). Primary and Secondary education does not have a sound and real Health Information Management system to assess or upgrade the services. Insufficient medical research and technical development at the national level is one of among the reasons to offer low-quality services (17).

All vertical programs are implemented at the primary Healthcare facilities but sponsored and funded by the Federal Government. This leads to conflict at BHU and district level since they are excluded from planning of the programs above. Another missing link in health policies is closely related to the mentioned activity – monitoring and evaluation. Absence of a system that could be used to gather, analyze and apply data for assessment and policy change at the district level. Consequently, data is not given to Federal Ministry to allow provision of feedback and evaluation of vertical programs (17).

RESEARCH METHODOLOGY & DATA COLLECTION

Aiming to achieve success in the targeted desired objectives, following below shared research methodology and major stops were followed:

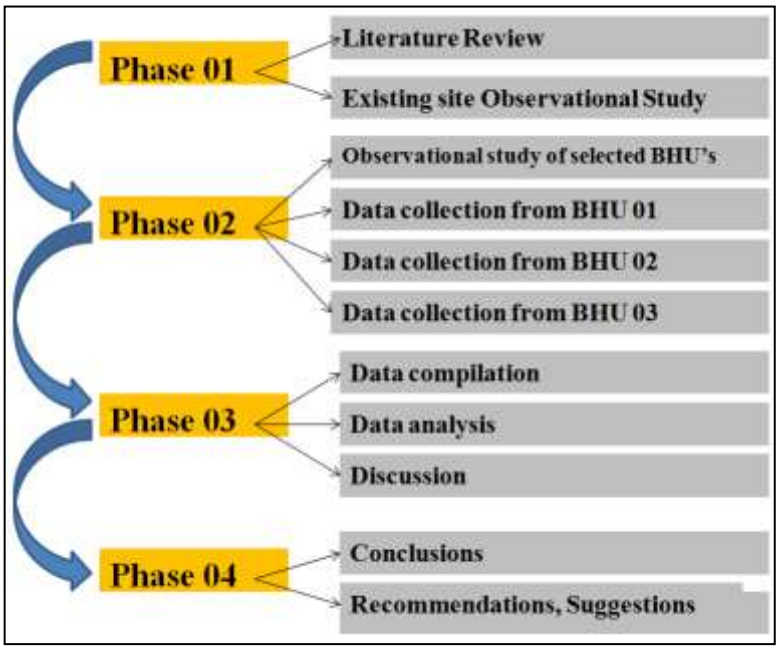

Figure 01 Research Flow Chart

As evident from figure 01, research was broken into multiple phases to make it manageable. First focused on observational study and review of critical literature followed by observational studies and data collection from respondents in selected three BHU where data collection was done after observational studies were completed to better analyze and discuss the current issues and their causes during both summer and winter seasons. Phase 03 focused on data compilation, analysis and discussion. Phase 04 was mainly about developing conclusion, findings and recommendations to the research. Populations of the research area was large, hence in order to make the research exploration manageable, sampling technique of purposive sampling was used based on three selected BHU's in the Barkhan city. The sample size for each hospital was kept to 25 respondents who were willing to participate along with staff as well where they are allowed.

Following below are the three major locations of the BHU visited for data collection along with their Google Earth Map locations and coordinates:

Table 01 Locations details of selected BHU

S.No	Location Name	Coordinates	Google Earth Map
01	Rakhni	30° 2'42.85"N 69°55'31.52"E	

02	Busti Fateh Muhammad	29°54'0.23"N 69°31'37.40"E	
03	Basti Ehsani - Chaiir	29°54'11.68"N 69°34'27.71"E	

Details of site visits to multiple selected BHU's and their purposes were stated below:

Table 02 Site visit details

S.No	Location	Season	Months	Visits / Purpose
01	Rakhni	Summer	May, 2021	Observational study & respondents data collection.
02	Busti Fateh Muhammad	Summer	June, 2021	Observational study & respondents data collection.
03	Basti Ehsani - Chaiir	Summer	July, 2021	Observational study & respondents data collection.
04	Rakhni	Winter	November, 2021	Observational study & respondents data collection.
05	Busti Fateh Muhammad	Winter	December, 2021	Observational study & respondents data collection.
06	Basti Ehsani - Chaiir	Winter	January, 2022	Observational study & respondents data collection.

As shown above in the table 02, multiple site visits for each BHU was done in both summer and winter seasons. Since both Summer and Winters are becoming severe in the context of the Barkhan city, it was significant that both seasons data be gathered in the form of observational study as well as respondents data through questionnaire.
Multiple site visits to each site were done. The site visit pictures of multiple sites are shown below:

Figure 01 Entrance gate of Rakhni BHU.

Figure 02 Internal building of Rakhni BHU, rear side.

Figure 03 Existing Basic Health Unit in Rakhni, Front side

Figure 04 Basti Ehsani (Chaiir) Front entrance of BHU

Figure 05 Researcher discussion and data collection in Summer from BHU Busti Fateh Muhammad staff

Figure 06 On duty Doctor room in BHU Basti Ehsani (Chaiir)

Figure 07 Girder & T-Iron roof system installed

Figure 08 Wall construction were mainly

in almost all the BHU – Picture of Basti Ehsani (Chaiir) BHU	4.5-9.0” bricks with 0.5” plaster finish with no insulation and wooden doors and frames for opening

Figure 09 Flooring was done with either tiles or concrete finish – Lab space

As shown above in the pictures of the multiple visited BHU units in Barkhan city, the conditions were not conducive environmentally at all. There was an utter lack of any form of environmental consideration in the design or construction process and hence have lead to a building which was not comfortable for the end users in either season. The observational sheet based responses are shared below in table 03 for each BHU visited in summer and winter seasons. Each visit was done between 10:00 AM and researcher stayed till 03:00 PM and observed the functional usage as well as respondents data was collected. For measuring of temperature and humidity, digital environmental meter was used.

Table 03 Observational study

Environmental variables explored in BHU			**Summer Season**			**Winter Season**			**Total**	**%**
S.No	**Aspect**	**Questions**	Rakhni	Busti Fateh Muhammad	Basti Ehsani - Chaiir	Rakhni	Busti Fateh Muhammad	Basti Ehsani - Chaiir		
The overall ranking was on 5 Likert scale with 1-Highly Unsatisfied, 3-Moderately satisfied and 5-Highly Satisfied										
1	Spatial layout	Satisfaction with spaces well designed and functional ?	2	2	2	2	2	2	12	40%
2	Floor & wall surfaces	Satisfaction with floor and wall finishes as per BHU needs?	3	2	3	3	2	3	16	53%
3		Satisfaction with insulation provided in Roofs & Walls?	1	1	1	1	1	1	6	20%
4	Acoustic environment / Noise	Satisfaction with noise and acoustic consideration present in design?	1	1	1	2	1	1	7	23%

5	HVAC	Satisfaction with HVAC integration into the design?	1	1	1	1	1	1	6	20%
6	Thermal environment	Satisfaction with temperature in the indoor space comfort level?	2	3	2	3	3	3	16	53%
7		Satisfaction with humidity in the indoor space comfort level?	1	2	1	3	3	2	12	40%
8		Satisfaction with natural cross ventilation / air movement in BHU?	3	3	2	3	3	2	16	53%
9	Visual environment	Satisfaction with natural lighting during day hours usage of BHU?	4	4	3	4	3	3	21	70%
10		Satisfaction with artificial lighting used in day hours?	1	2	1	1	3	1	9	30%
11		Satisfaction with landscape or natural views for end users?	1	2	1	1	2	1	8	27%
12	Ergonomic environment	Satisfaction with the furniture and finishes comprehended in local context?	1	2	1	1	1	1	7	23%
13		Satisfaction with furniture for end users comfort level?	1	1	1	1	1	1	6	20%
14	Way finding	Satisfaction with signage available in local and national languages?	1	2	1	1	2	1	8	27%
15	**Total**		23	28	21	27	28	23		
16	**Percentage**		33%	40%	30%	39%	40%	33%		

As shown above in table 03, observational sheet was compiled for both winter and summer seasons after visiting the selected three BHU's multiple times. With reference to the selected variables and the responses for each BHU in both seasons is comparatively not much having any major variation. Since overall design and planning of all three units have been same along with their materials selection and construction methodology, hence they have responded comparatively very close. The overall comparison of summer observational sheet is shown below in Figure 10. The overall comparison of winter observational sheet is shown below in Figure 11. As explored, researcher was able to comprehend that winter was comparatively better managed in the three explored BHU with

respect to selected environmental variables. Natural lighting, indoor temperature and material based finishes for walls, floors and ceilings responded well in the winter. However in summer most of the variables were in the unsatisfactory range at large.

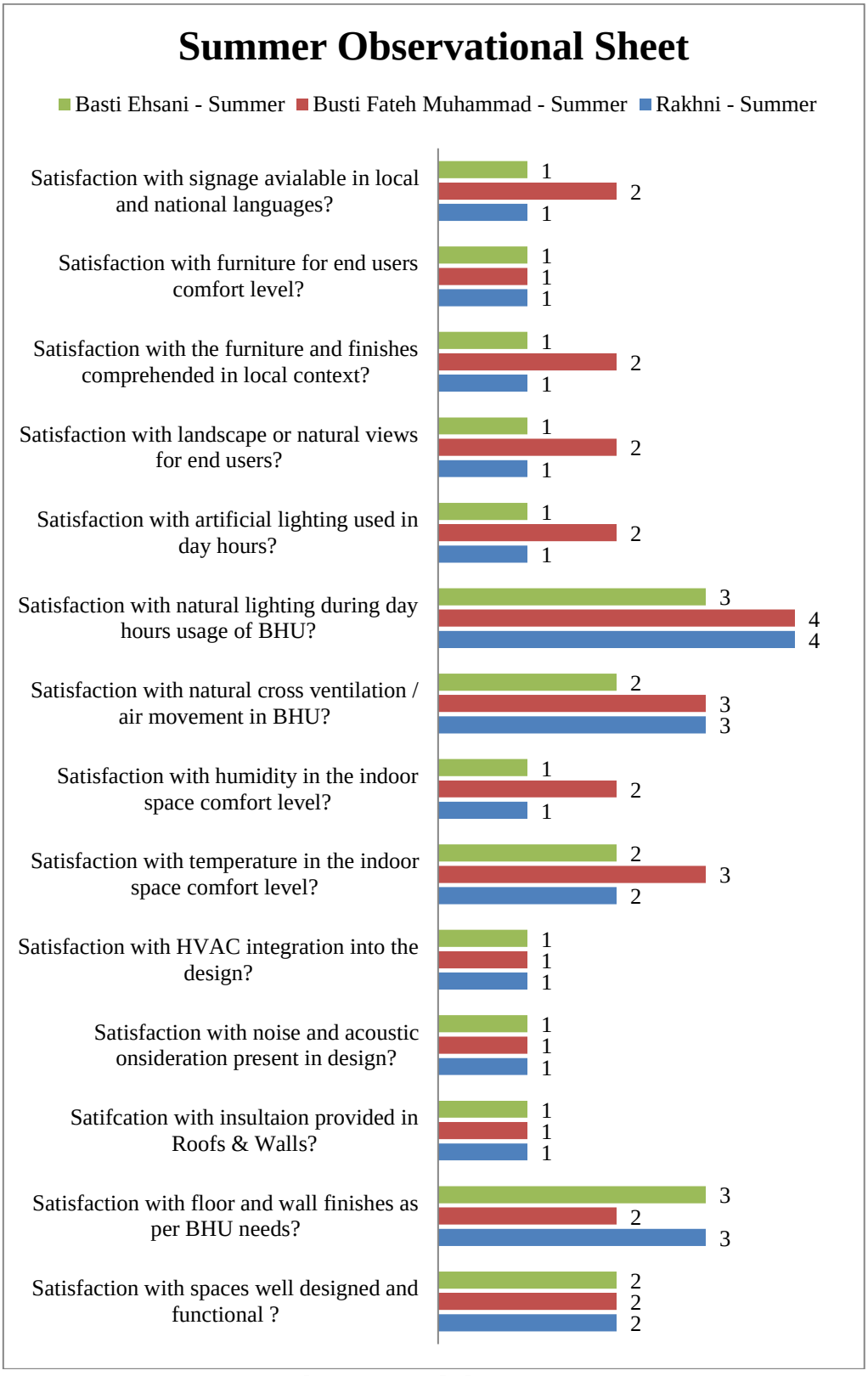

Figure 10 Observational sheet – Summer Data

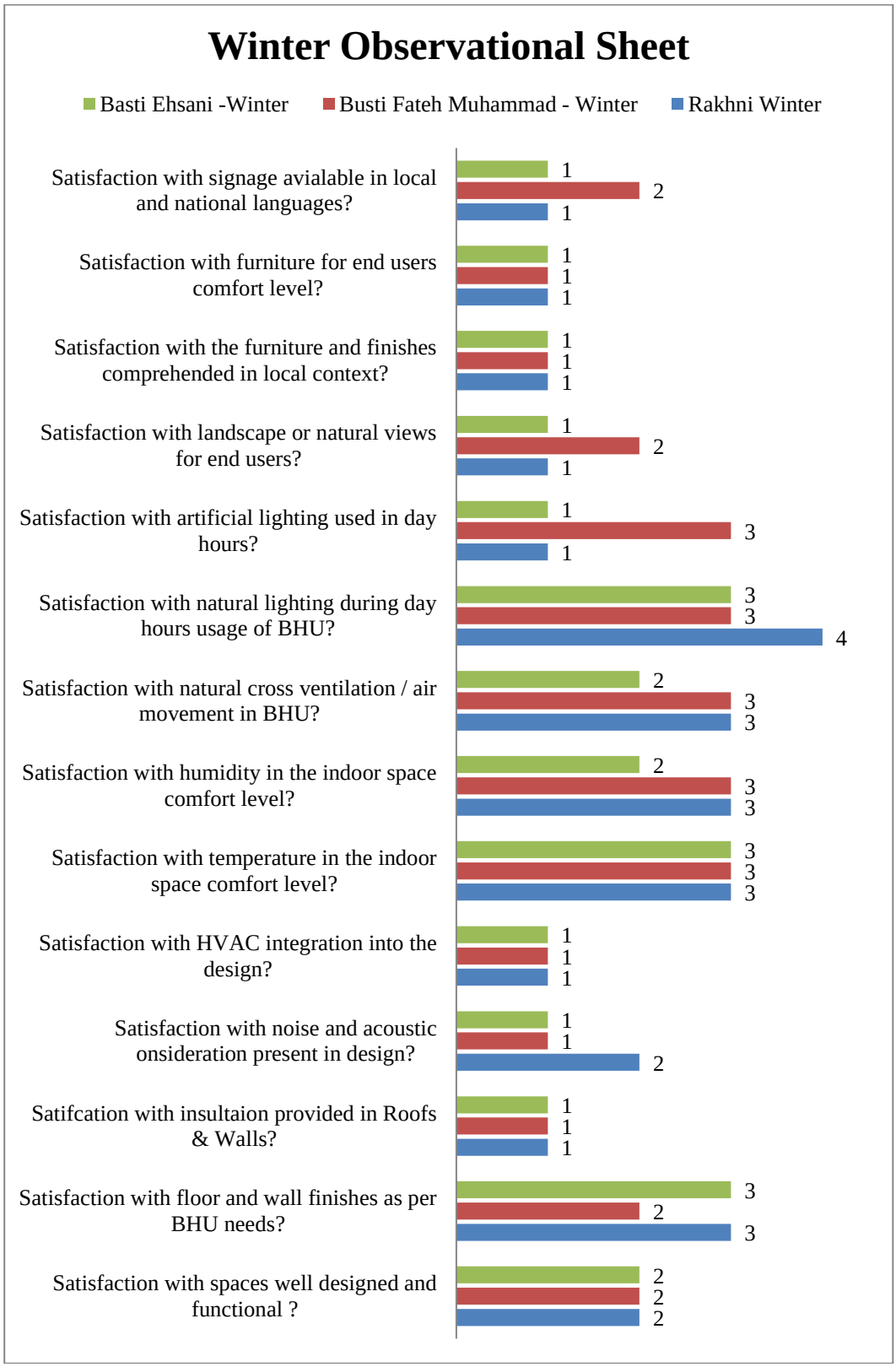

Figure 11 Observational sheet – Winter Data

As per the observational study was carried on, respondents data was also collected simultaneously from the explored three BHU's. The questionnaire used to gather data was based on the observational checklist and also used the 5 choice Likert scale. The respondents collected data is shown below in Table 04 for BHU Rakhni, table 05 for BHU Basti Fateh Muhammad and table 06 for BHU Basti Ehsani respectively.

Table 04 Respondents data for BHU Rakhni

Environmental variables explored in BHU Rakhni			Summer Data					Winter Data				
S.No	**Aspect**	**Questions**	**Highly Unsatisfied**	**Unsatisfied**	**Moderate**	**Satisfied**	**Highly Satisfied**	**Highly Unsatisfied**	**Unsatisfied**	**Moderate**	**Satisfied**	**Highly Satisfied**
1	Spatial layout	Satisfaction with spaces well designed and functional ?	13	5	4	3	0	15	6	2	2	0
2	Floor & wall surfaces	Satisfaction with floor and wall finishes as per BHU needs?	9	4	6	5	1	7	3	7	7	1
3		Satisfaction with insulation provided in Roofs & Walls?	16	6	3	0	0	10	8	5	2	0
4	Acoustic environment / Noise	Satisfaction with noise and acoustic consideration present in design?	9	8	6	2	0	6	7	5	5	0
5	HVAC	Satisfaction with HVAC integration into the design?	19	5	1	0	0	10	8	5	2	0
6	Thermal environment	Satisfaction with temperature in the indoor space comfort level?	16	4	4	1	0	7	5	9	4	0
7		Satisfaction with humidity in the indoor space comfort level?	12	5	5	3	0	5	5	3	11	1
8		Satisfaction with natural cross ventilation / air movement in BHU?	6	3	9	6	1	7	4	3	10	1
9	Visual environment	Satisfaction with natural lighting during day hours usage of BHU?	4	4	2	12	3	3	4	4	13	1
10		Satisfaction with artificial lighting used in day hours?	12	5	4	4	0	14	4	6	1	0
11		Satisfaction with landscape or natural views for end users?	19	3	3	0	0	15	3	3	4	0
12	Ergonomic environment	Satisfaction with the furniture and finishes comprehended in local context?	12	8	5	0	0	7	6	5	7	0
13		Satisfaction with furniture for end users comfort level?	12	6	5	2	0	6	5	5	9	0

14	Way finding	Satisfaction with signage available in local and national languages?	6	6	1	12	0	4	3	2	13	3

As shown above in the table 04, the respondents data related to environmental exploration clearly showed that respondents were mainly unsatisfied with all the variables in summer with moderate acceptance for signage, natural lighting and cross ventilation. However in winter, the respondents data also show moderate acceptance for humidity level and overall interior finishes as well.

Table 06 Respondents data for BHU Basti Fateh Muhammad

Environmental variables explored in BHU Busti Fateh Muhammad			**Summer Data**					**Winter Data**				
S.No	**Aspect**	**Questions**	**Highly Unsatisfied**	**Unsatisfied**	**Moderate**	**Satisfied**	**Highly Satisfied**	**Highly Unsatisfied**	**Unsatisfied**	**Moderate**	**Satisfied**	**Highly Satisfied**
1	Spatial layout	Satisfaction with spaces well designed and functional ?	14	6	4	1	0	11	7	5	2	0
2	Floor & wall surfaces	Satisfaction with floor and wall finishes as per BHU needs?	11	5	5	4	0	9	5	6	5	0
3		Satisfaction with insulation provided in Roofs & Walls?	16	8	1	0	0	11	7	4	3	0
4	Acoustic environment / Noise	Satisfaction with noise and acoustic consideration present in design?	10	7	7	1	0	6	7	7	5	0
5	HVAC	Satisfaction with HVAC integration into the design?	20	3	2	0	0	14	6	5	0	0
6	Thermal environment	Satisfaction with temperature in the indoor space comfort level?	17	6	1	1	0	15	5	5	0	0
7		Satisfaction with humidity in the indoor space comfort level?	14	7	4	0	0	11	7	5	2	0
8		Satisfaction with natural cross ventilation / air movement in BHU?	7	5	8	5	0	4	4	9	8	0
9	Visual environment	Satisfaction with natural lighting during day hours usage of BHU?	6	7	5	7	0	3	4	8	10	0
10		Satisfaction with artificial lighting used in day hours?	13	7	4	1	0	10	3	8	4	0
11		Satisfaction with landscape or natural views for end users?	18	4	3	0	0	15	3	3	4	0

12	Ergonomic environment	Satisfaction with the furniture and finishes comprehended in local context?	11	4	6	4	0	10	7	5	3	0
13		Satisfaction with furniture for end users comfort level?	13	7	5	0	0	10	4	8	3	0
14	Way finding	Satisfaction with signage available in local and national languages?	11	6	1	7	0	10	4	5	5	1

As shown above in the table 05, the respondents data related to environmental exploration clearly showed that respondents were mainly unsatisfied with all the variables in summer with moderate acceptance for natural cross ventilation only. However in winter, the respondents data also show moderate acceptance for natural lighting, cross ventilation and artificial lighting.

Table 06 Respondents data for BHU Basti Fateh Muhammad

Environmental variables explored in BHU Basti Ehsani			**Summer Data**					**Winter Data**				
S.No	**Aspect**	**Questions**	**Highly Unsatisfied**	**Unsatisfied**	**Moderate**	**Satisfied**	**Highly Satisfied**	**Highly Unsatisfied**	**Unsatisfied**	**Moderate**	**Satisfied**	**Highly Satisfied**
1	Spatial layout	Satisfaction with spaces well designed and functional ?	15	5	5	0	0	12	6	5	2	0
2	Floor & wall surfaces	Satisfaction with floor and wall finishes as per BHU needs?	13	5	3	4	0	12	5	5	3	0
3		Satisfaction with insulation provided in Roofs & Walls?	16	9	0	0	0	14	5	5	1	0
4	Acoustic environment / Noise	Satisfaction with noise and acoustic consideration present in design?	10	7	7	1	0	6	7	7	5	0
5	HVAC	Satisfaction with HVAC integration into the design?	20	3	2	0	0	12	8	3	2	0
6	Thermal environment	Satisfaction with temperature in the indoor space comfort level?	17	6	1	1	0	11	7	5	2	0
7		Satisfaction with humidity in the indoor space comfort level?	15	4	6	0	0	13	5	5	2	0
8		Satisfaction with natural cross ventilation / air movement in BHU?	9	5	5	6	0	9	6	4	6	0
9	Visual environment	Satisfaction with natural lighting during day hours usage of BHU?	4	5	10	6	0	4	3	12	6	0
10		Satisfaction with artificial lighting used in day hours?	16	8	1	0	0	15	6	4	0	0
11		Satisfaction with landscape or natural views for end	18	4	3	0	0	17	4	4	0	0

		users?											
12	Ergonomic environment	Satisfaction with the furniture and finishes comprehended in local context?	15	5	5	0	0	12	5	8	0	0
13		Satisfaction with furniture for end users comfort level?	12	7	5	1	0	11	4	4	6	0
14	Way finding	Satisfaction with signage available in local and national languages?	11	6	1	7	0	10	5	5	5	0

As shown above in the table 06, the respondents data related to environmental exploration clearly showed that respondents were mainly unsatisfied with all the variables in summer with moderate acceptance for natural day lighting only. However in winter, the respondents data also show moderate acceptance for natural day lighting and noise management only.

In order to evaluate the observational study with respondents data from all the three selected BHU explored i.e. Rakhi, Basti Fateh Muhammad and Basti Ehsani, an overall combined evaluation of respondents data is shown below in table 07.

Table 07 Respondents data combined for all three BHU

S.No	Aspect	Questions	Highly Unsatisfied	Unsatisfied	Moderate	Satisfied	Highly Satisfied	Highly Unsatisfied	Unsatisfied	Moderate	Satisfied	Highly Satisfied	Total	%
1	Spatial layout	Satisfaction with spaces well designed and functional ?	42	32	39	16	0	38	38	36	24	0	265	35%
2	Floor & wall surfaces	Satisfaction with floor and wall finishes as per BHU needs?	33	28	42	52	5	28	26	54	60	5	333	44%
3		Satisfaction with insulation provided in Roofs & Walls?	48	46	12	0	0	35	40	42	24	0	247	33%
4	Acoustic environment / Noise	Satisfaction with noise and acoustic consideration present in design?	29	44	60	16	0	18	42	57	60	0	326	43%
5	HVAC	Satisfaction with HVAC integration into the design?	59	22	15	0	0	36	44	39	16	0	231	31%

6	Thermal environment	Satisfaction with temperature in the indoor space comfort level?	50	32	18	12	0	33	34	57	24	0	260	35%
7		Satisfaction with humidity in the indoor space comfort level?	41	32	45	12	0	29	34	39	60	5	297	40%
8		Satisfaction with natural cross ventilation / air movement in BHU?	22	26	66	68	5	20	28	48	96	5	384	51%
9	Visual environment	Satisfaction with natural lighting during day hours usage of BHU?	14	32	51	100	15	10	22	72	##	5	437	58%
10		Satisfaction with artificial lighting used in day hours?	41	40	27	20	0	39	26	54	20	0	267	36%
11		Satisfaction with landscape or natural views for end users?	55	22	27	0	0	47	20	30	32	0	233	31%
12	Ergonomic environment	Satisfaction with the furniture and finishes comprehended in local context?	38	34	48	16	0	29	36	54	40	0	295	39%
13		Satisfaction with furniture for end users comfort level?	37	40	45	12	0	27	26	51	72	0	310	41%
14	Way finding	Satisfaction with signage available in local and national languages?	28	36	9	104	0	24	24	36	92	20	373	50%

Based on the percentages from the respondents data, a comparison with observational study is shown below in figure 12:

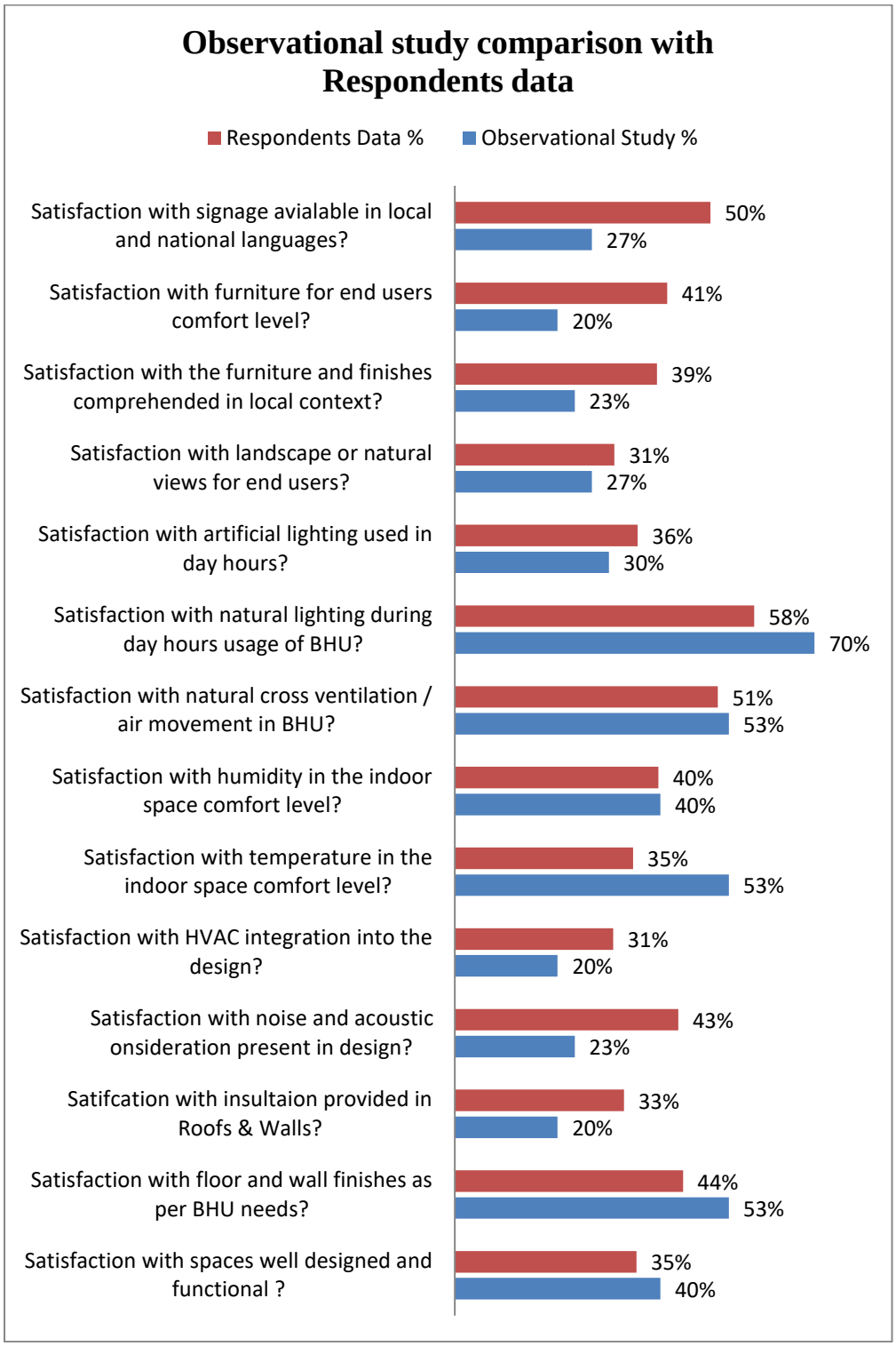

Figure 12 Observational study comparison with Respondents data

It is evident from the comparison above that in both the Summer and Winter seasons explored with respect to selected environmental variables for BHU, only natural day lighting performed better in both seasons with natural day lighting, cross ventilation and humidity level management in winter was acceptable. Rest of all the major variables failed to satisfy the observational study done by the researcher as well as the respondents data collected from the staff, patients and attendants.

RESULTS

Findings mainly included that due to weather severity in Summer and moderate weather in winter, buildings explored better performed in Winter as compared to summer. Major variables explored included Satisfaction with spaces well designed and functional, Satisfaction with floor and wall finishes as per BHU needs, Satisfaction with insulation provided in Roofs & Walls, Satisfaction with noise and acoustic consideration present in design, Satisfaction with HVAC integration into the design, Satisfaction with temperature in the indoor space comfort level, Satisfaction with humidity in the indoor space comfort level, Satisfaction with natural cross ventilation / air movement in BHU, Satisfaction with natural lighting during day hours usage of BHU, Satisfaction with artificial lighting used in day hours, Satisfaction with landscape or natural views for end users, Satisfaction with the furniture and finishes comprehended in local context, Satisfaction with furniture for end users comfort level and Satisfaction with signage available in local and national languages. Most of the variables failed to satisfy the researcher as well as the end users.

DISCUSSION

It was concluded that Winter season was moderate and hence buildings better performed in winter season. Overall environmental factors were mainly ignored in the current design and construction of the buildings. One typical developed design of BHU was repeated as per the governmental system which failed to correspond to the weather and climatic variations of the current context and location. Severe summer was hard to be managed by the current building and apart from natural day lighting and natural cross ventilation, all major factors explored failed to satisfy the respondents as well as the researcher. Winter season was moderate, hence apart from natural day lighting, natural cross ventilation, even humidity level management and indoor thermal comfort values were better. The buildings used steel girders, T-Iron bars and prefabricated slabs which resulted in lack of any form of insulation in roofs. The bricks used were of inferior quality and lacked any internal or external insulation. Construction mechanism used clearly showed that BHU was not expected to expand in future. Landscape and allied aspects were completely ignored. Local language in the signage was not used however Urdu as National language was used. Most of the furniture was in poor condition and not well maintained. Artificial lighting was also not well designed and failed to fulfill its purpose in most of the times. There was no infection control policy, procedure or system in place. HVAC system was also missing and hence no bifurcation of spacing was possible. Privacy was a major factor which contributed to managing the functional usage of spaces through bifurcation for gender based approach and interior spaces. Public facilities for attendants were also missing. Overall noise was not a major issue yet due to very thin walls, the people talking inside the clinic could be easily heard outside. Hence privacy was no more valid. It can be concluded that the existing design failed to incorporate any major environmental factors in design or construction phase and hence there lies a need to revisit the whole building with a more holistic approach.

Following major recommendations are proposed that there is a need to revisit the existing design with reference to each site explored separately. Incorporate the climatic considerations in the BHU design evolution along with incorporation basic lab facilities. Environmental considerations must include critical factors like natural day light, thermal comfort, indoor humidity and cross ventilation management, insulation for roof and walls, selection of materials for furniture and furniture should be that which may be easily used by patients rather than regular office furniture. For future, building orientation must be considered in design. Ambulance accessibility and movement of vehicles to the main building must be incorporated. Also incorporate the local cultural values in the operational side where not interfering with healthcare functionality for ease of use and acceptability in the local context. Provide atleast one room for the staff for managing the facility on 24 hour basis. With recent mega floods in 2022, most of these BHU faced a very high influx of patients and failed to manage it. Keeping inline with recent pandemic and climate change implications, these challenges must be considered in design of these facilities through integration of climatic and weather data towards climate responsive design development. Preference for local and durable materials for

construction like stone and marble be preferred to reduce the building carbon footprint is a critical need for making these building sustainable.

Conclusion

The evaluation of Basic Health Units (BHUs) in Barkhan, Balochistan, highlights significant deficiencies in environmental design, particularly in addressing local climatic needs. The standardized government design fails to provide adequate thermal comfort, insulation, noise control, and lighting, leading to low user satisfaction, especially during summer. The study underscores the need for a comprehensive redesign that considers the region's specific environmental and cultural context. Improving BHU designs with climate-responsive, sustainable, and culturally sensitive approaches is essential for enhancing primary healthcare quality in rural Pakistan.

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