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The impact of Salutogenic factors on the process of patient's recovery
Case study; Erbil city hospitals

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ABSTRACT

The quality of the built environment could highly impact our state of wellbeing, by affecting our stress and exposure within the building environment. Scientific studies linked stress to depression, diabetes, obesity, and cardiac disease. Hospitals considered as stressful places due to their inconvenient experiences. The theory of Salutogenic design aims to reduce stress through the implementation of an interdisciplinary design study to enhance the sense of coherence (SOC) for any individual to be able to adapt himself to the overall life challenges. Salutogenic defines several factors which can affect an individual's state of well-being in any space. This research limited on two of these design factors (daylight, colour) within three selected hospital through a critical methodology using a sample questionnaire of 15 questions headed to 90 from all three hospitals. the second part of the methodology using a Light-meter device for calculating the amount of Lux in actual hospital conditions, the third part of research methodology is a simulation program (Ecotect) to have an adequate daylight calculation in the wards of all three hospitals as well as the lighting distribution with (daylight factor) to evaluate the efficiency of wards in Erbil city. The last part of the study is by a field investigation by the researcher for the implementation of Salutogenic Colours. through a critical methodology approach.The research results shows that wards of three hospitals has a poor natural daylight to penetrate the building, and hospitals depends mainly on artificial light which causes uncomfortability and inconsitnecy in treatment process. Patients prefrences are twords new colours such as turquoise, palepink, and blue rather than the tradtional colours used in Erbil governmental hospitals. using light meter as assessment tool to compare between the Ecotec Lux measurement and the actual condition of lighting in hospital. The evaluation of three Wards within hospitals shows clearly the un sufficiency of natural lighting which leads to needing of artificial daylight. And might delay the process of recovery. Ecotect calculates the most suitable design condition in any city and finds other suitable orientations for buildings.

1. Introduction

Architecture and infrastructure have a significant impact on human health and wellbeing that might affect negatively or positively.(Environmental2016)

The place of living and your surrounding environment can highly determine your state of wellbeing.(Dilani, 2010) Medicine sociologist

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Aaron Antonovsky developed a theory of health. He observed in a concentration camp during 2nd world war in Nazi Germany that some people die immediately, but some people maintain good health despite the same environmental exposure and condition. Antonovsky found the theory of Salutogenesis and the sense of coherence, he discovered that we should concentrate on wellness factor rather than a risk factor. (medicine and 1990,) The same theory was developed further and apply to architecture called "Salutogenic Design" in 1997 and applied to build environment by professor Alan Dilani the founder of the International Academy for design and health. Salutogenesis can be defined as primary addressed in the field of health psychology, behavioural medicine, and sociology of health. Dilani believes that sense of coherence can be translated to architecture. The sense of coherence which is the core of Salutogenic has three components and consist of (comprehensibility) which means the world is understandable. (manageability) can be understood as resources meet the situation and (meaningfulness) which indicate that life makes sense. The theory is mainly about how to deal with stress and how to reduce stress in the built environment. (Maass, Lillefjell and Espnes, 2016) Dilanis theory of Salutogenic design explains comprehensibility in architecture means how can we manage in a built-up environment the perception of the building as wayfinding and welcoming without stress, and (manageability) the way of managing the build environment, urban planning and complexity of infrastructure in general, or how to be comfortable and finally (meaningfulness) to enhance our emotion and satisfy our experiences inside the building. the research paper tries to overview the significant of Salutogenic approach, how essential this theory be applied in the Kurdistan region and specifically in hospitals in Erbil city. (Tsekleves and Cooper, 2017)

1.1Background

According to Dilani the theoretical gap that exists in the theory is between the theory itself and application of factors mentioned above, there is a lack of interdisciplinary of psychology, sociology, and neuroscience that neglected by the architecture designers. wellness design factors main objectives are to reduce stress. ('Dilani book', 2018) it's essential to integrate these factors into a physical environment to make an individual happy and comfortable inside that space.in health care design Salutogenic is looking for psychosocial factors that could highly affect patient and staff these factors have been developed through years by many health care experts.in his latest article Dilani mentioning several factors that could significantly reduce stress for patient and visitors in hospitals and health care environment the factors are:(Mittelmark *et al.*, 2017)

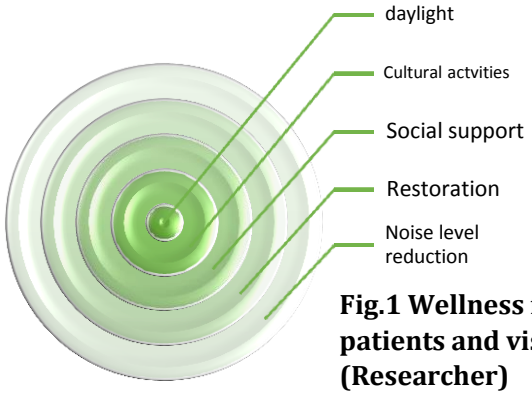


Fig.1 Wellness factors as growing intent for patients and visitors in health care facilities. (Researcher)

[i]Dilani explaining in detail the Salutogenic theory. He is mentioning several factors that might affect individuals state of the well-being the main theory of Salutogenic is the Sense of coherence(Soc)which consist of Comprehensibility, Manageability, and Meaningfulness. Dilani defines each word and translating each term according to architecture

point of the view. the main concern of the theory is how to deal with stress or how to reduce stress. people who can manage stress usually they have stronger health. comprehensibility means how to deal with the built-up environment the perception of the building without stress. manageability which means how can we manage the building the movement of occupants inside that space .and meaningfulness means how to design a pleasant space and how to make people happy inside that built-up environment the figure below illustrates the translating of Salutogenic theory into architecture design factors.

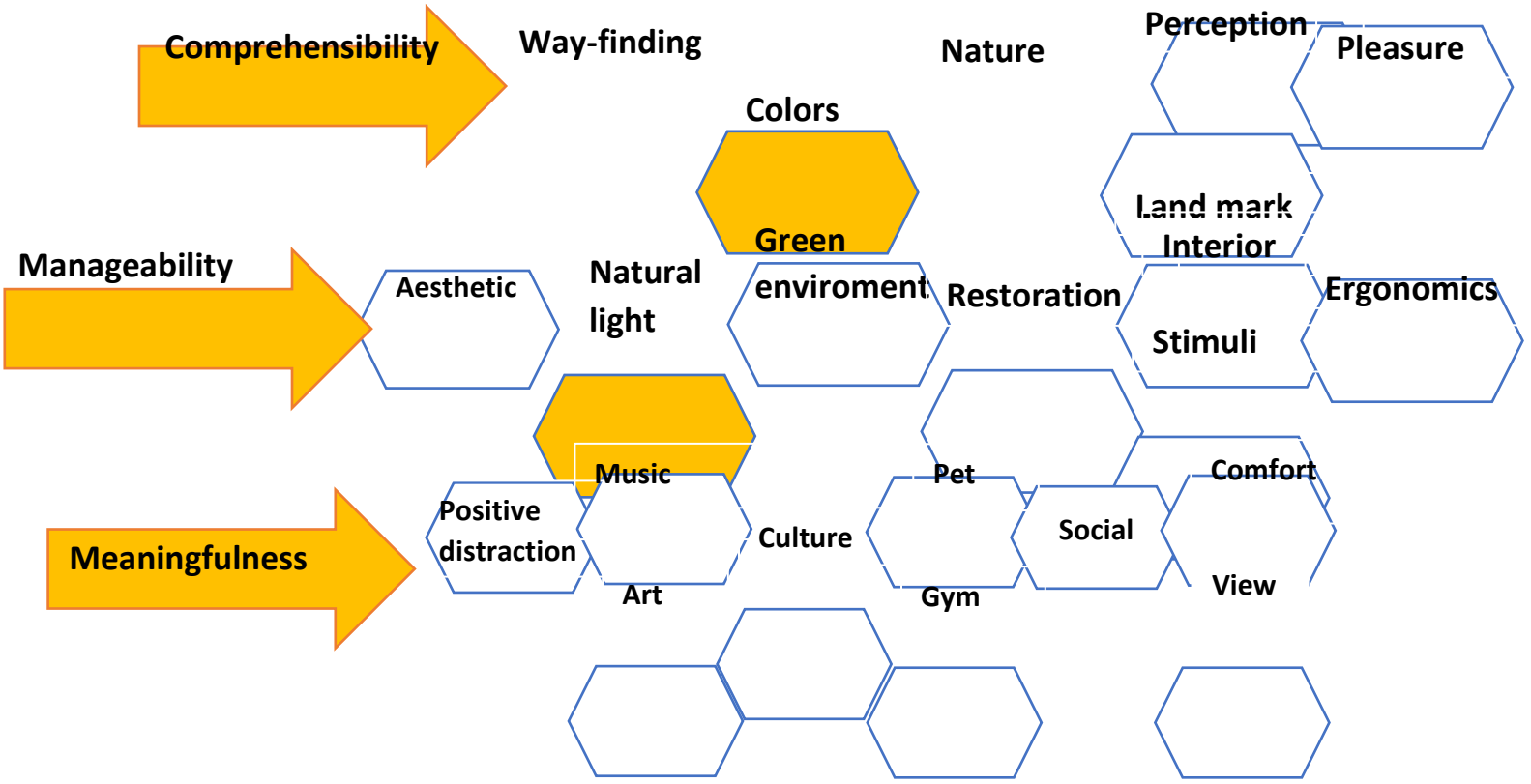


FIG1.2Translating Salutogenic theory into architectural design factors. (Dilani, 2010)

1.2 The objectives of the study

1-To assess natural daylight and colour in the wards for all the three hospitals

2-To reduce stress and enhance the state of well-being of patients.

3-To have an overall idea of the theory of Salutogenic design and its impact on stress reduction

1.3 Limitations Two factors only take place in this research (Daylight, Colour). The reason of selecting these two factors is the lack of research study for light and colour specifically for the hospital wards in Erbil city, as its the only place which patinets remain for longer time. The research mainly covers three governmental hospitals in Erbil city. The selected hospitals are **(Rizgary general hospital, Nanakali hospital, West-emergency hospital**). Wards will be calculated through practical experiment by light meter and then tested as simulation geometry Ecotect software to get most precise intensity of light (Lux) and to evaluate the daylight distribution inside each Ward.

2.Methodology

This research paper conducted four tools of measurement as an approach to the research methodology

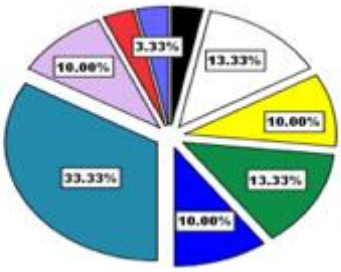
A-questionnaire: a sample size of 90 people were selected in three hospitals in Erbil city, the number of participants in each hospital is 30 people.

B-light-meter: the data will be collected through a practical experiment. a special instrument used only to calculate lux called **(**Light meter**)** inside hospitals selected area from the research. Collected data from each hospital will be compared to standards of lighting intensity from the global hospital.

C - Ecotect simulation program which calculates natural-daylight representing a quantitative data analyzing to determine daylight factor to evaluate hospitals in Erbil city for daylight efficiency.

D -Field investigation availability and unavailability of Salutogenic Colours in Erbil city hospitals.

Result & conclusion 93% per cent for both hospitals (Rizgary and west-emergency) answered yes to have natural daylight and 90% of Nanakali hospital answered yes for natural daylight.



3.Figures and tables

Rezgary.H **West-emergency.H** **Nankali.H**

Fig.1.3 colour prefrences by patients in all three hospital.

Table.1 explains different lighting results of patients for all three hospitals.(researcher)

Name	No.Patients		Q.1 Are you satisfied with the overall lighting condition for your hospital?	Q.2 Does the natural or artificial lighting level (brightness, intensity) make you uncomfortable?	Q.3 Do you want to have natural light and window in your room?	Q.4 Do you face any difficulty in finding your way in the hospital? because of un sufficiency of lighting for places such as (laboratory, wards, pharmacy, etc)?	Q.5 Does the hospital sign, information board, coloured lines on floor easy to understand and visible to see?	Q.6 Does the lighting condition appropriate to have some personal activity such as (drinking, eating, reading)
Three hospitals included for the survey of medical and none medical staff	30 people have participated in each hospital							
Rizgary hospital	30	yes	**%74**	**%30**	**%93**	**%33**	**%60**	**%70**
		N0	**%26**	**%70**	**%7**	**%67**	**%40**	**%30**
		I don't know						
Nanakali hospital	30	yes	**%85**	**%50**	**%90**	**%10**	**%60**	**%95**
		N0	**%15**	**%40**	**%10**	**%90**	**%40**	**%5**
		I don't know		**%10**				
West-emergency hospital	30	yes	**%77**	**%27**	**%93**	**%33**	**%60**	**%97**
		N0	**%13**	**%73**	**%7**	**%53**	**%27**	**%3**
		I don’t know	**%10**			**%14**	**%13**	

Name	No.patients	Q.1 Which of the following colours is your favourite?	Q.2 Are you satisfied with the existing colours of the current hospital?	Q.3 Do colours helps you to find your way for places such as (Wards, laboratory, pharmacy, etc)?	Q.4 Do colours affect your mood? Do you think colours make you happy?	Q.5 Please write down any specific colour that you dislike?	Q.6 Which of the following do you prefer to use to find your way?	Q.7 Does your hospital need a colour change?	Q.8 If you believe that the hospital needs a colour change please define the reason?	Q.9 Do you want to have greenery in your room?
Three hospitals included for the survey of medical and none medical staff	Total 90									
Rizgary hospital	30	Turquoise %37 Green %17 Pale-pink %13	V.Satisfied %7 Satisfied %60 Unsatisfied %33	Yes %67 No %33 I don't know	Yes %10 No %90 I don't know	Black %50 Yellow %17 Green %10	Both %50 Colours %23 Hospital sign %27	Yes %87 No %13 I don't know	A %33 B %46 C %21	Yes %100
Nanakali hospital	30	Turquoise %33 Green %13 White %13	v.satisfied %30 Satisfied %60 Unsatisfied %10	Yes %43 NO %33 I don't know %33	Yes %67 No %30 I don't know %3	Black %53 Yellow %16 Red %10	Both %50 Hospital sign %43 Colours %7	Yes %73 NO %27 I don't know	A %35 B %48 C %18	Yes %100
West-emergency hospita	30	Turquoise %33 Blue %17 Pale-pink %10	v.satisfied %17 Satisfied %67 Unsatisfied %16	Yes %57 NO %37 I don't know %6	Yes %77 No %23 I don't know	Black %43 Yellow %27 Red %23	Both %70 Hospital sign %20 Colours %10	Yes %73 NO %27	A %40 B %47 C %13	Yes %97 NO %3

Table1.2 different result of colour result of patients for all three hospitals. (researcher)

Table.1.3 the amount of Light intensity in Lux measured by light-meter on the first floor in Rizgary hospital for each Ward. (researcher)

No.	Name of the zone selected	The amount of LUX	Location of the point
1	Wards-3beds	100	First floor-entrance
2	Wards-3beds	150	First-floor-center
3	Wards-3beds	280	First-floor-End
4	Wards-6beds	175	First-floor-entrance
5	Wards-6beds	250	First-floor-center
6	Wards-6beds	500	First-floor-End
7	Wards-4beds	150	First floor-entrance
8	Wards-4beds	197	First-floor-center
9	Wards-4beds	250	First-floor-End
10	Wards-6beds	130	First floor-entrance
11	Wards-6beds	250	First-floor-center
12	Wards-6beds	500	First-floor-End
13	Wards-4beds	150	First floor-entrance
14	Wards-4beds	250	First-floor-center
15	Wards-4beds	300	First-floor-End
16	Wards-4beds	140	First floor-entrance
17	Wards-4beds	220	First-floor-center
18	Wards-4beds	282	First-floor-End
19	Wards-6beds	144	First floor-entrance
20	Wards-6beds	295	First-floor-center
21	Wards-6beds	420	First-floor-End
22	Wards-4beds	200	First floor-entrance
23	Wards-4beds	260	First-floor-center
24	Wards-4beds	300	First-floor-End
25	Wards-6beds	130	First floor-entrance
26	Wards-6beds	210	First-floor-center
27	Wards-6beds	420	First-floor-End
28	Wards-3beds	110	First floor-entrance
29	Wards-3beds	175	First-floor-center
30	Wards-3beds	100	First-floor-End

Table 1.4 the amount of Lighting intensity measured by light-meter on the ground floor of Nanakali hospital. (researcher) as an indication of lighting condtion in the hospital.

No.point	Name of the zone selected	The amount of LUX	Location of the point
1	Hospital entrance	**22**	Ground-floor-entrance (1)
2	Hospital entrance	**30**	Ground-floor-entrance (2)
3	Hospital-entrance	**20**	Ground-floor-entrance (3)
4	Hospital-lobby	**30**	Ground-floor-Lobby
5	Waiting-area	**20**	Ground-floor-waiting area
6	Waiting-area-2	**125**	Ground-floor-waiting area 2
7	Corridor	**25**	Ground-floor-corridor
8	Clinic-1	**37**	Ground-floor-doctors room
9	Clinic-2	**35**	Ground-floor-doctors room
10	Clinic-3	**55**	Ground-floor-doctors room
11	Wards-10 beds-emergency	**18**	Ground-floor-entrance
12	Wards-10 beds-emergency	**26**	Ground-floor-center
13	Wards-10 beds-emergency	**60**	Ground-floor-End
14	Wards-10 beds-emergency	**28**	Ground-floor-entrance
15	Wards-10 beds-emergency	**37**	Ground-floor-center
16	Wards-10 beds-emergency	**100**	Ground-floor-End
17	Wards-5 beds-emergency	**17**	Ground-floor-entrance
18	Wards-5 beds-emergency	**38**	Ground-floor-center
19	Wards-5 beds-emergency	**40**	Ground-floor-End
20	Wards-8 beds-thalassemia	**38**	Ground-floor-entrance
21	Wards-8 beds-thalassemia	**33**	Ground-floor-center
22	Wards-8 beds-thalassemia	**35**	Ground-floor-End
23	Wards-8 beds-thalassemia	**38**	Ground-floor-entrance
24	Wards-8 beds-thalassemia	**50**	Ground-floor-center
25	Wards-8 beds-thalassemia	**24**	Ground-floor-End
26	Wards-8 beds-women	**30**	Ground-floor-entrance
27	Wards-8 beds-women	**90**	Ground-floor-center
28	Wards-8 beds-women	**38**	Ground-floor-End

Table 1.5 the amount of lighting intensity Lux measured by light-meter on the ground floor of the

No.point	Name of the zone selected	The amount of LUX	Location of the point
1	Entrance	**260**	Ground-floor-Entrence
2	Casualties man -8 beds	**25**	Ground-floor-Entrance
3	Casualties man -8 beds	**35**	Center of the room
4	Casualties man -8 beds	**25**	The endpoint of the room
5	Casualties women- 8 beds	**25**	The entrance of the room
6	Casualties women- 8 beds	**35**	Center of the room
7	Casualties women- 8 beds	**17**	The endpoint of the room
8	Lobby	**10**	Ground-floor-lobby
9	Lobby-2	**5**	Ground-floor-lobby
10	Accountant	**5**	Ground-floor
11	Registration	**15**	Ground floor
12	Data-saving	**20**	Ground-floor
13	Archives	**38**	Ground-floor
14	Nurse room	**110**	Ground-floor
15	Lobby-3	**15**	Ground-floor adminstration
16	Meeting-hall administration	**22**	meeting hall-first point
17	Meeting-hall administration	**20**	Meeting-hall-centre of the hall
18	Meeting-hall administration	**15**	Meeting-hall-end point of the hall
19	Doctors room	**25**	Ground-floor
20	Staff-manager room	**27**	Ground-floor
21	It-room	**18**	Ground-floor
22	Assistant-manager room	**18**	Ground-floor
23	Sacriteraite-room	**18**	Ground-floor
24	Manager-room	**50**	Ground-floor
25	Small-operational room	**178**	Ground-floor

west-emergency hospital, as an indication of lighting condtion in the hospital.(researcher)

Ecotect: Ecotect selected three specific weather conditions in Erbil city for the calculations in a very specific time period

- **A-** Erbil **hottest** day in the year (21st of July at 10:30 AM)
- **B-** Erbil **sunniest** day in the year(30th May at 1:30 PM)
- **C-** A mostly **overcast** day in the year (16th December 2:30 PM)

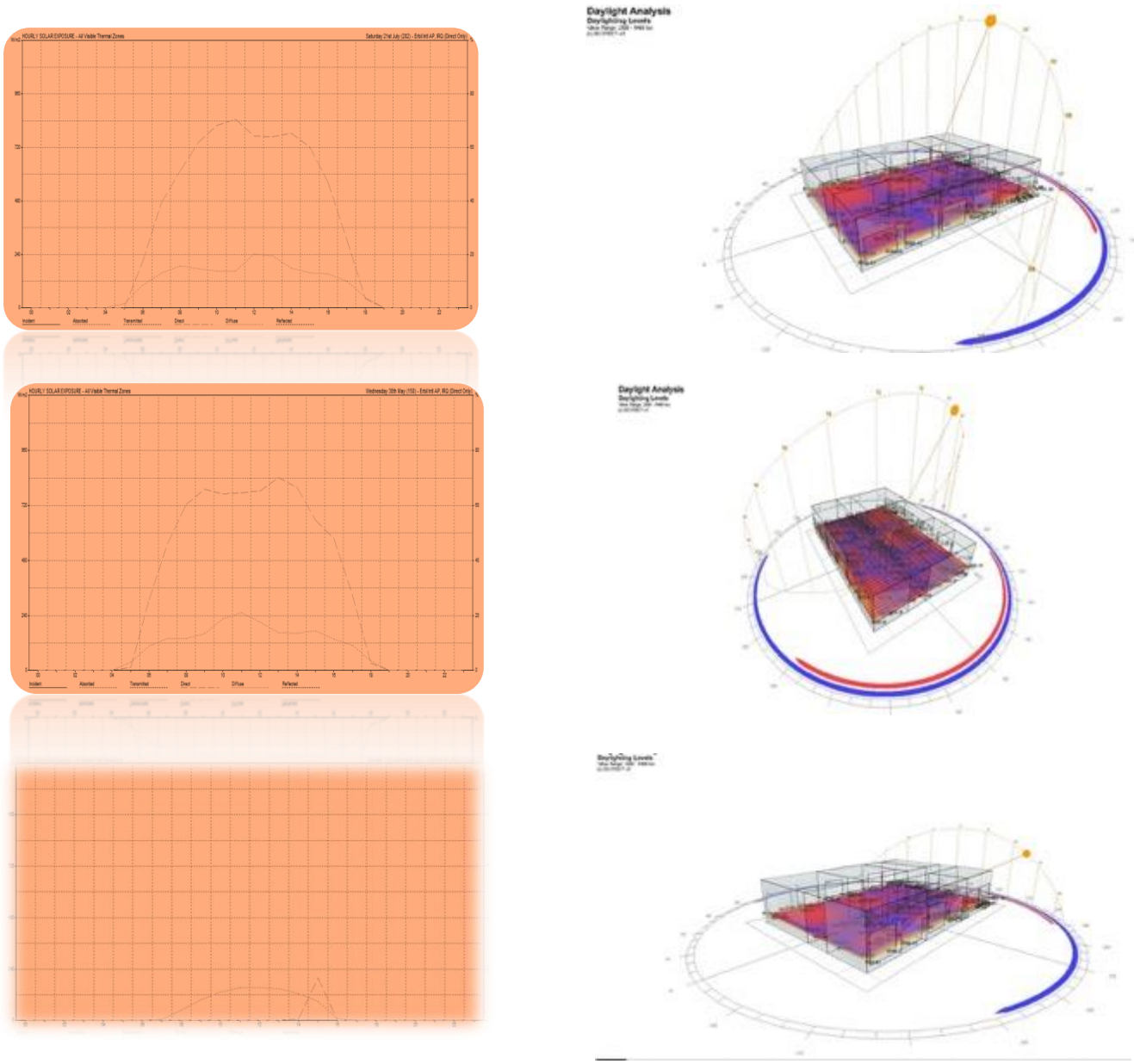
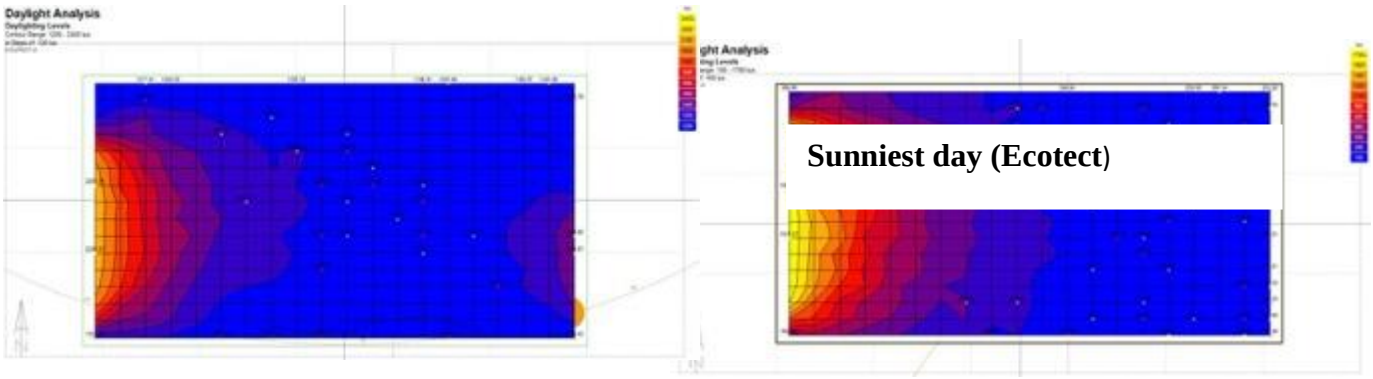
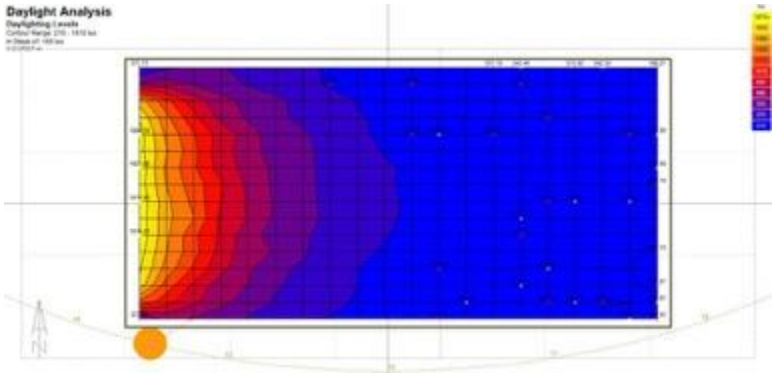


Fig1.4 Ecotect daylight calculation for hospitals in Erbil city through different times of year (researcher).



Hottest day (Ecotect)

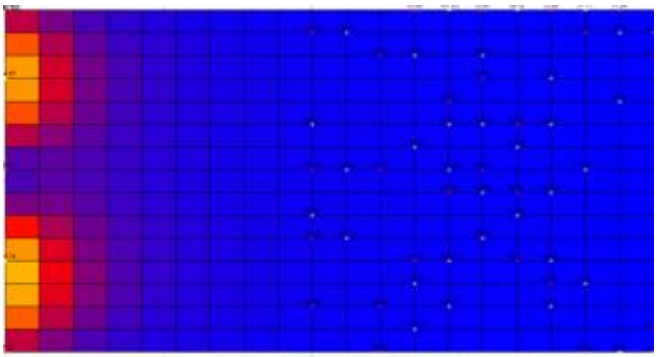


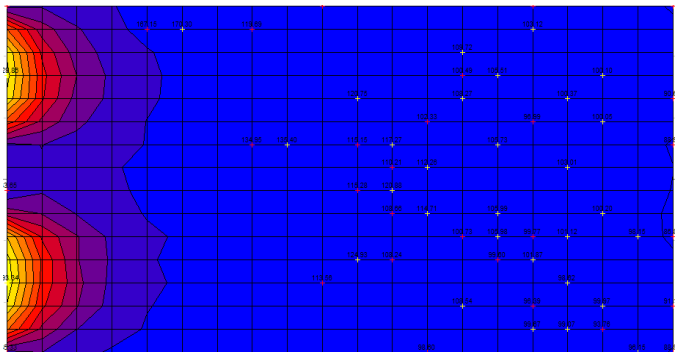
2.6m

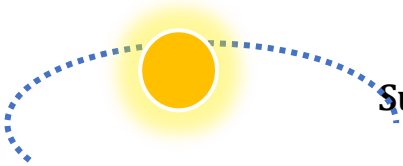
5.2m

Most overcasted day (Ecotect)

Fig.3.4.7 the distribution of natural daylight in 3bed type wards of Rizgary hospital. (Author)

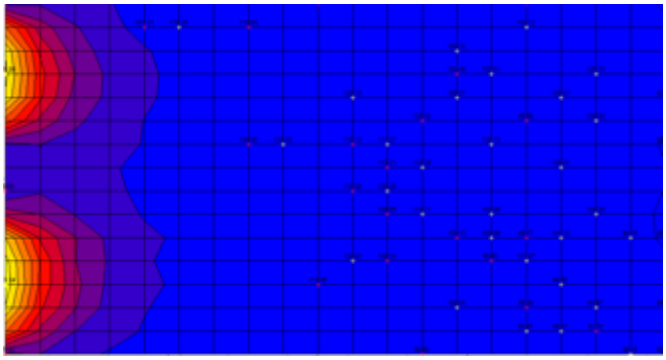






Hottest day (Ecotect)

Sunniest day (Ecotect)



6.0m

11.6m

Most overcast (Ecotect)

Fig.3.5.2 illustrates daylight distribution in type-B wards at Nanakali hospital at a different time of the year. (author)

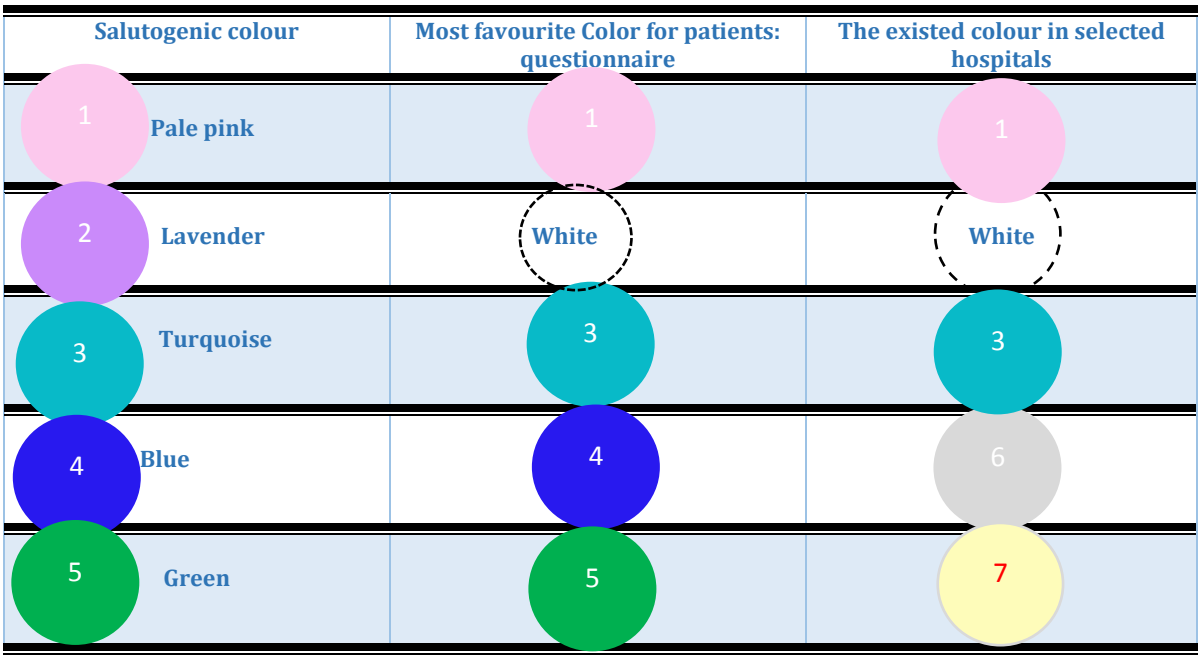


Fig1.5 The existed Colours applied in hospitals in Erbil city. (researcher)

4.Conclusion

In light of this study, the results show that there is a lack of natural daylight in the hospital wards. Hospitals mainly depending on artificial light which creates an unpleasant environment for the medical staff becomes very challenging to provide the best medical services for patients. Patients prefer natural daylight with big openings which can help them psychologically to enhance their wellness and this might fasten the process of recovery for the patients and facilitate the management system for both medical and none medical staff. The negative impact of artificial light is energy consumption, financial costs for the governments which might increase the burden on the government. The daylight factor shows the minimum availability of natural daylight and hospitals. The need for artificial light is mandatory in all wards to provide suitable lighting conditions for both patients and staff. The research also illustrates that wards are often used traditional colours such as white, yellow, and different shades of white. The questionnaire shows clearly that patients want to experience different colours, however, they chose colours that are close to nature such as turquoise, blue, and pale-pink. Most of the participant are not happy with the current colours exist in Erbil city hospital as the colours can not help the patients the differentiate between the zones either in pathfinding process which plays a major role to help patients to find their paths inside the hospital. the existed colour can not accelerate the process of recovery both psychologically nor physically because they cants reduce patients stress inside those wards as the result there will be a delay in the process of recovery.

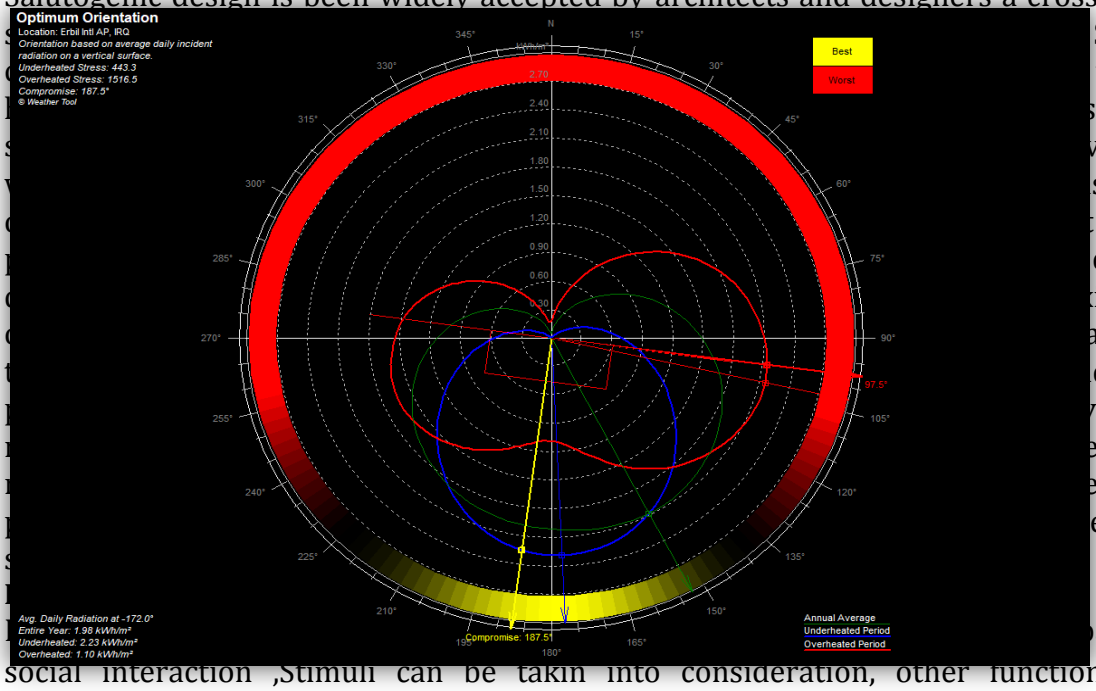
Table1.6 the daylight factor evaluation for the hospital in Erbil city. (researcher)

Name of the hospital	Types of the wards	Daylight factor (DF)%100	Assessment according to DF.
Rizgary hospital	3-bed wards	**4.6**	Good daylight- artificial light needed.
Rizgary hospital	4-bed wards	**9.0**	Very good daylight- no need for artificial light
Rizgary hospital	6-bed wards	**4.4**	good daylight- the need for artificial light.
Nanakali hospital	5-bed wards	**1.9**	poor daylight condition with the need for artificial light.
Nanakali hospital	10-bed wards	**1.1**	Poor daylight conditions artificial light needed
Nanakali hospital	8-beds hospital	**2.4**	Fair lighting condition artificial light needed
West-emergency	8-beds	**0.3**	Very poor lighting conditions artificial lighting needed
West-emergency	4-beds RCU female	**2.5**	good lighting condition need for artificial light
West-emergency	4-beds RCU female second floor	**2.8**	good lighting condition need for artificial light

Ecotect managed to find the most suitable orientation for buildings in Erbil city according to Erbil weather condition, to avoid sun exposure and heat during hot-summer and to obtain most needed solar radiation in summer. The best orientation is a south-west compromise at 187.5° exclusively for Erbil city.

Fig.6 stereographic projection of the most suitable orientation for building according to Erbil city. (Researcher)

Recommendation



Salutogenic design is been widely accepted by architects and designers a cross the global, Salutogenic to be more sign factors, valuation of se studying affect staff directly to timized and atural light , d direct the light which e process of e process of ess time is athfinding , social interaction ,Stimuli can be takin into consideration, other function could be conducted such as schools ,house , or to bigger scale such as urban areas , the researcher can expand his field of study by finding the effect of Salutogenic design on student in hospital or on academic in universities.

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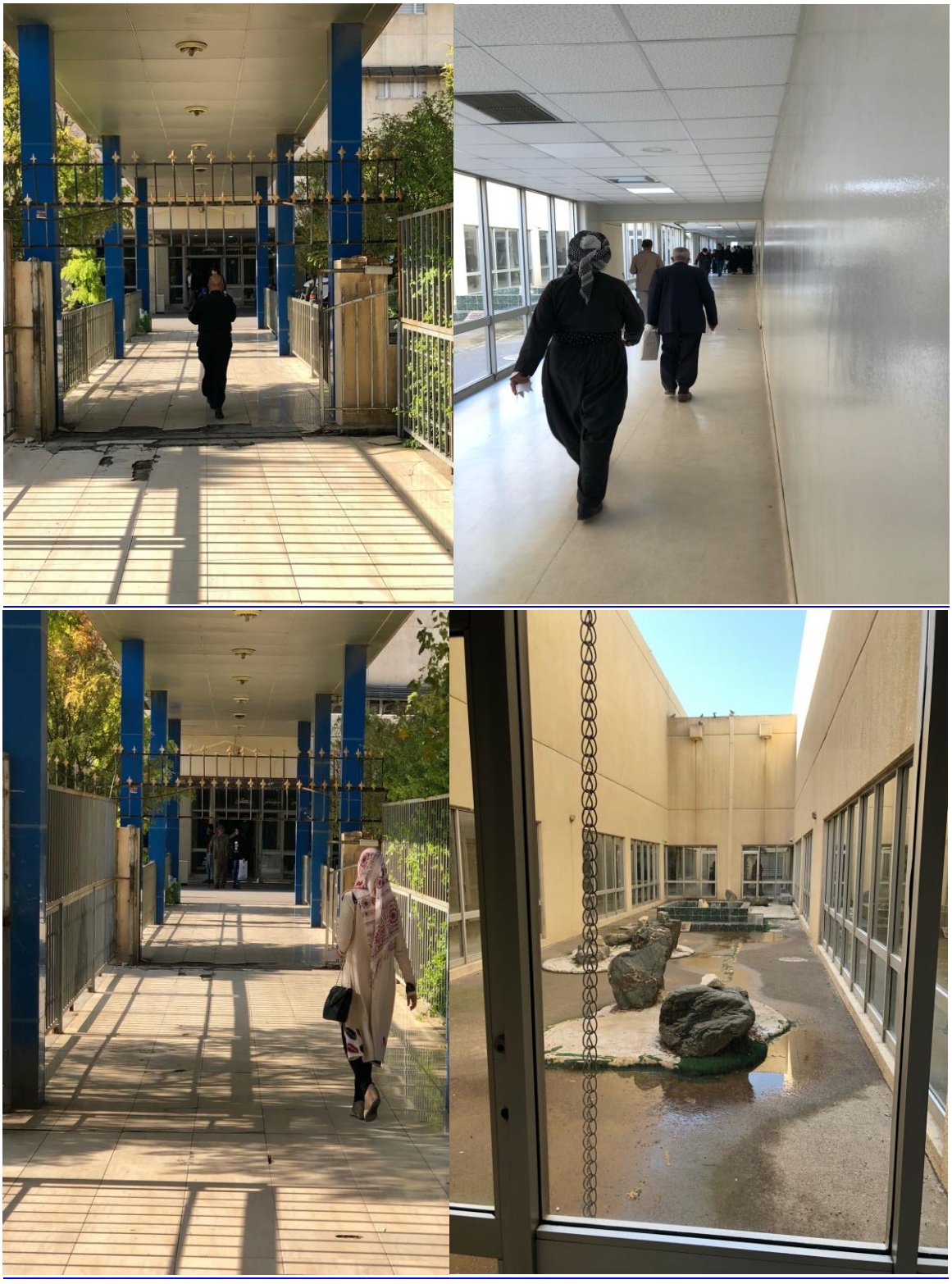
Appendix

General descriptions of hospitals case study

Rizgary hospital: typical Iraqi hospital built in the mid of eighties, also called 400bed hospital there are more than 10 hospitals similar to Rizgary hospital in all over Iraq.rizgary hospital built-in 1980 in Erbil city by Japanese company the construction of the entire hospital took 3 years finished in 1983. the hospital was ready to serve patients in 1984. the Japanese technical team remain managing hospital till 1987 due to political conflict in Iraq they left and hande it to Iraqis to manage the hospital. the hospital is 400-bed hospital including 8th floor including 2 water-tank, elevator motors and air handling unit from the top of the building. the hospital is considered to be a very busy hospital . its located between the intersection of 40-meter road street and 100-meter street in Erbil city.



Nanakali hospital: