Journal of Mediterranean Cities

2023, Volume 3, Number 1, pages 75–100

Comparative Analysis between the Architecture of Bimaristans in Egyptian and Syrian during Mamluk's Era

* Dr. **Maha AbouBakr Ibrahim**[1], Dr. **Hala Asslan**[2], Dr. **Mazen Mohamed Nassef**[3]

Misr University for Science and Technology, Faculty of Engineering, Architectural Engineering Department, Giza, Egypt[1]

Expert of the International Council of Monuments and Historic Sites (ICOMOS), CIVVIH, CIAV and Cultural Heritage Consultant[2]

Misr University for Science and Technology, Faculty of Engineering, Architectural Engineering Department, Giza, Egypt[3]

E-mail[1]*: maha.ibrahim@must.edu.eg, E-mail*[2]*: halaasslan2004@yahoo.fr , E-mail*[3]*: mazen.mohamed@must.edu.eg*

ABSTRACT

Bimaristans are a building type which emerged in the Islamic world equivalent to nowadays hospitals. Most of the Islamic architecture studies focus on mosques, then mausoleums. This makes the research field open for more studies on building types like baths, wekalat, etc. Bimaristans remain within the scope of structures that need more studies through comparatives and analytical analyses. This paper introduces comparative analysis between bimaristans in Cairo and Aleppo, with particular focus on those constructed during the Mamluk's era. This comparison highlights the points of similarity between the concepts that influenced the designers by that time with respect to their different locations, surrounding context and historical background. Such factors caused to make distinguished differences that gave each location its unique identity. This research depends on inductive-deductive methodology; inductive by reading and explaining the architectural drawings of both case-studies, and deductive from the theories and researches that justifies the reasons lied behind the end architectural product. Consequently, analyses the comparative results. The study provides architects and scholars with a clear image about the unique private identity of each zone, although they stand on the same believes using analytical analyses of bimaristans. Hence, contemporary architects in the Arab world can recognize the spiritual concepts behind the architectural and planning dimensions of bimaristans' discrete design, that they may use or re-use to regenerate new forms that reflect their local identity and satisfy local cultural needs. Also, the study clarifies the role of local artists in articulating such concepts using carved geometrical reliefs, in addition to the documentation role of decorating relieved texts on those structures.

ARTICLEINFO:

Article History

Received: June 30 2023

Revised: September 15 2023

Accepted: September 30 2023

Available online: Oct. 08 2023

Keywords:

Eutrophication; Rural Settlements; Quantum Growth; Worm Filters; Constructed Wetlands

JOURNAL OF MEDITERRANEAN CITIES (2023), 3(1), 75-100
https://doi.org/10.38027/mediterranean-cities_vol3no1_6

www.mediterranean-cities.com

1. Introduction

Studies in the field of Islamic architecture focused primarily on religious buildings (mosques and mausoleums). While public or domestic buildings did not receive enough attention from scholars. However, given the tangible reality of the Islamic heritage, we find that during the successive Islamic eras, the community took care of all types of buildings, whether religious or domestic, such as agencies,

Corresponding Author:
Dr. Maha AbouBakr Ibrahim
Misr University for Science and Technology, Faculty of Engineering, architectural Engineering department, Giza, Egypt.
E-mail: maha.ibrahim@must.edu.eg

How to cite this article:
Ibrahim, M. A., Asslan, H., & Nassef, M. M. (2023). Comparative Analysis between the Architecture of Bimaristans in Egyptian and Syrian during Mamluk's Era. Journal of Mediterranean Cities, 3(1), 75-100.
https://doi.org/10.38027/mediterranean-cities_vol3no1_6

baths, residential buildings, and others. Among the building types that attracted their attention were the bimaristans. As the preservation of public health was an integral part of building the civilization of the Islamic society.

However, there are some few researches that describe and mention the bimaristans along the flourished periods in the Islamic era. The topics covered in the majority of these dissertations include bimaristan's origins, types, and policies. Whereas, the question of the bimaritan's history and the precise date that the first one was constructed has been impossible to determine (Ragab, 2015). Then, more important considerations are about what constitutes a bimaritan and what function this institution served in the Islamic societies. Also, (El-Baba, 2009) in his master's degree dissertation mentioned the various types of bimaristans as follows; leprosy, mentally ill and those for strangers, handicapped, disabled and blind people (Akram Muhammad Yahya, 2018), such types can be considered as public (Elyan, 2002). Moreover there were specialized bimaristans and others for the care of students and orphans (Al-Kubaisi, 2006). In addition of prisoners and military (Abdullah, 2012) bimaristans. Moreover, he classified them into portable and permanent hospitals.

Although the origins of building bimaristans are unknown, some studies suggested that they may have originated in prehistoric Iranian and Iraqi societies (Sherif Kaf, 2007) or may have been passed down as a result of the impact of Western Christian culture (Riva & Cesana, 2013). This is in reference to the plan to construct a hospital-specific structure. Contrarily, some other researchers contend that because of the Crusaders' close proximity to the Muslims in El-Quds, European nations were impacted by this building type (Ragab, 2015).

From the architectural point of view, some authors and scholars used the documented bimaristans to put their analyses from different perspectives. From an environmental point of view (Belakehal et al., 2004) considered sunlight as a crucial component of the architecture of the bipartisanz since it was thought to have medicinal advantages. To prevent warming and glare, control over sunlight admission has to be implemented due to the region's harsh climate. Iwan, screened windows, and partially covered courtyards were thus utilized depending on the type of activities performed in the various sections of the bipartisan. (Alansari & Hirao, 2017) were able to identify the presence of numerous architectural components that consider the environmental aspect in the same context and via their analytical investigation, which helps to enhance medical performance. These components include accounting for the necessary height and providing enough room for natural ventilation. As well as techniques that promote solar exposure, like Iwans, wide windows, or open courtyards. Additionally, (Maraqa et al., 2014) created a system to evaluate the effectiveness of these architectural components in Bimaristan Al-Qaimari - Damascus, emphasizing their role in enhancing the Bimaristan's medical performance. From another angle, and based on the idea of biophilic design, the results of deeper investigation (Abdelaal & Soebarto, 2018) shows a strong association between innovation-generation processes and the built environment in conventional higher education institutions. Where architects can adopt certain lessons from such "timeless" buildings to develop their methodologies to put their design for contemporary hospitals.

The aforementioned research makes it abundantly evident that during the Islamic nations' affluent periods, the bipartisan building type spread throughout them. But its architectural evaluation needs a lot of investigation, which prompts the question; what similarities and differences exist between this architectural product in terms of place and time? And how was the composition and creation of the Bipartisan impacted by Islamic culture? Since the inception of Islam, through the Umayyad era, and into the Ottoman era, many of these bimaristans have been referenced in historical books and academic researches. Few of them have, however, been architecturally recorded, which hinders the process of comparative study between them. The study will therefore be restricted to a comparison between bimaristans in Egypt and Syria during the Mamluk era in order to find tangible results. From another side,

Egypt and Syria were key political capitals of the Islamic caliphate that time, and they were also firmly linked militarily, commercially and culturally.

We can identify the similarities in the composition and formation of this building type through this analytical study of the architectural components found in bimaristans in Egypt and Syria, and we can also realize in concrete terms the intellectual integration between Islamic societies, despite the differences in the architectural product resulting from each society's unique geographic location and historical background.

2. Methodology

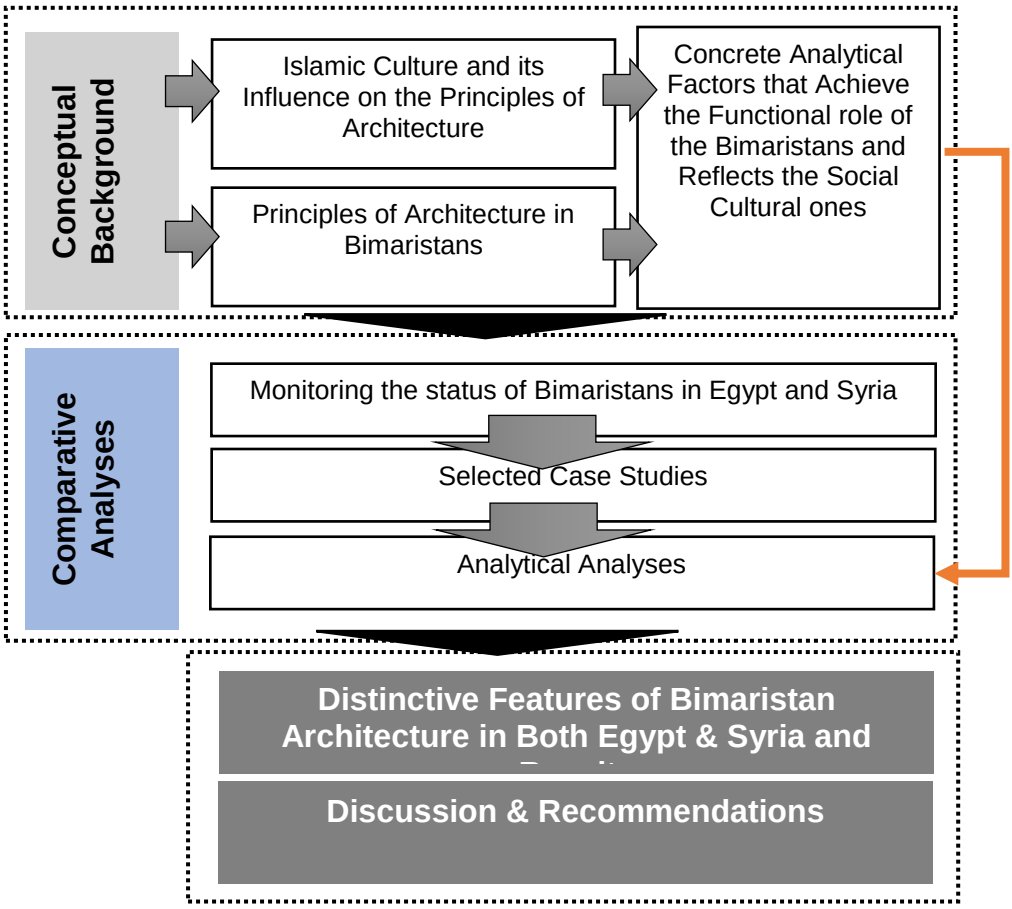


Figure 1. Structure of the Study (Developed by Author)

The research methodology depends on the results of previous studies that dealt with the common concepts of Islamic culture, on which the general principles of Islamic architecture in general are based. It spreads from one Islamic nation to another during the flourishing Islamic Ages. In addition to studying the functional architectural components made mandatory in traditional bimaristans. By examining two models of bimaristans, one in Egypt and the other in Syria during the Mamluk era, it is simple to find the applications of these principles to the two models, these applications are within the scope of the similarities between the two models. On the other hand, by dismantling the architectural elements and comparing them with their counterparts in the other model (portal, iwan, courtyard, healing areas, distribution of functional zones, structural elements, ceilings, and domes), it is possible to elicit differences and identify their causes, whether historical, economic or environmental.

The structure of the research consists of four parts. The first chapter reviews the state of conceptual background of designing bimaristans as a functional building type, for an Islamic community regarding its cultural paradigm. This part provides a tool for conducting an analytical comparison between bimaristans in Egypt and Syria, containing physical factors for the architecture of bimaristans. The second part reviews the aforementioned bimaristans in Egypt and Syria, and provides an accurate description of the selected case studies. Then, the analytical comparison is made according to the architectural design factors derived from the first part of the study. The third part of the research highlights the points of distinction between the Bimaristans in Egypt and Syria during the Mamluk era, to find out the reasons for those differences, whether political, economic, environmental or otherwise. The fourth chapter considers the recommendations and discuss the main contributions of this paper (Figure 1).

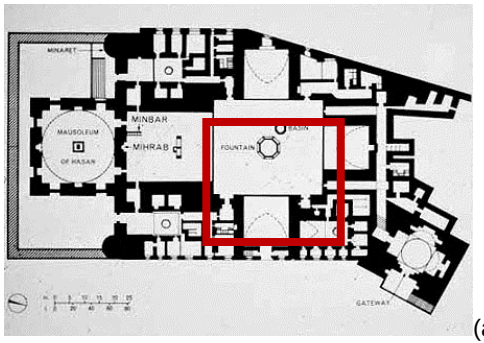
3. Conceptual Background

This section of the research is divided into two parts. The first part is related to the general concepts of Islamic architecture that are derived from Islamic culture. These concepts are typically applied to most building types (mosques - houses - agencies - public baths, etc.) that Islamic societies cared about throughout their ancient historical eras. The architecture of bimaristans and the architectural components they contain to fulfil the required function in terms of health care are the subject of the second half.

3.1. Islamic Culture and its Influence on the Principles of Architecture

Islamic Architecture is characterized by being based on concrete cultural and religious bases that were mainly generated from their interpretation of Qur'an and Sunnah, and that were of significant influence on the Islamic Architecture of almost all building types known by that time. This influence formed a strong character for different building types that had significant features each of which is based on a strong concept generated from the Islamic culture, this applies to plans as well as facades of their buildings.

One of the main features that was always present in most types of buildings is the Courtyard. Most of the Islamic buildings regardless to their types (Residential, mosques, schools, bimaristans……etc.) were characterized by having a central (square or rectangular) court in the center of building, or centralize the building in the correct sense, the court besides the useful environmental role it plays to allow natural lighting into interior spaces and to aid in ventilating these spaces, and the great role it plays in achieving privacy in the interior spaces overlooking it and that are not desired to be exposed to the outer facades, it had also a strong cultural concept which was the main reason for its presence. In the Islamic culture the square is a symbol of earth, while the dome is a symbol of the sky, God's throne is carried by eight angels over the water (و يحمل عرش ربك فوقهم يومئذ ثمانية) (AlHaqqah, verse 17), (و كان عرشه على الماء) (Houd, verse 7). This resulted in the presence of the square or rectangular courtyard referring to earth with a central fountain or water feature referring to the water under God's throne, in many cases the fountain is covered with an octagonal wooden structure referring to the eight angels carrying God's throne and then covered by a small dome referring to the sky in which God's throne is present above all. (Figure 2) (Gabr, 1992)



(a)


(b)

Figure 2. Plan and photo of Sultan Hassan mosque and Madrassah (being a prototype of Islamic Mamluk Architecture) showing the central squared court with its above mentioned featues (Behrens-Abouseif, 2007)

Majaz was also one of the main characteristics of Islamic buildings, simply it is the indirect entrance that creates a clear visual and audio separation between inside and outside of the building, a technique that was innovated to achieve the most possible privacy for the interior spaces, as a privacy is a main characteristic of Islamic culture that is highly valued and always required to be achieved (Figure 3a).

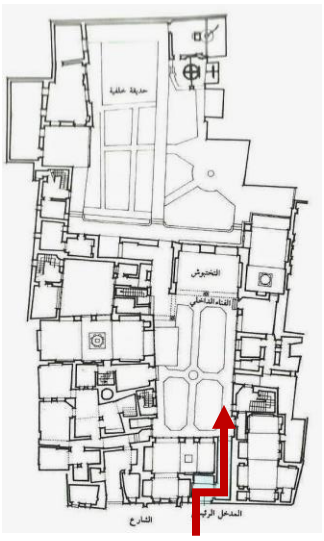


Figure 3. (a) Ground floor plan of Al Sehemy House (prototype of Islamic houses in Egypt) highlighting the Majaz at its main entrance, and showing the central rectangular court (Behrens-Abouseif, 1992), (b) Shot from the court of Al Sehemy house showing mashrabias on windows (*Bayt Al-Suhaymi ("House of Suhaymi"*, n.d.)

At the same time facades of Islamic buildings also had certain features and characteristics that were also generated from cultural concepts. Pointed arches were the main shape used for the openings of Islamic buildings either for windows or doors. The pointed arch apart from being an appropriate structural system for openings in stone structures, they also had a cultural concept pointing to the sky creating a virtual spiritual bond between the building and the sky. The same applies to vaults which

were always pointed arches and were used excessively especially in constructing Iwans in mosques and madrassahs as those shown in the above photo of Sultan Hassan complex.

Also, Mashrabia (Figure 3b) is among the main known features of Islamic building facades, a wooden mesh of designed with respect to Islamic ornaments always used as a shutter on most windows playing an environment role to allow indirect sunlight into the interior space but at the same time plays a more important role in achieving privacy and expressing the Islamic art.

3.2. Principles of Architecture in Bimaristans

Bimaristans were designed in traditional Islamic times to achieve their primary functional purpose, which is complete health care. This is in accordance with the culture of society emanating from the Islamic faith. Where the designer was keen to prepare the healing spaces so as to achieve complete physical and psychological comfort for the patient, and simultaneously support the employees and medical professionals in their efforts to complete their duties fully and to practice charity in their work to the best extent possible. In terms of functionality, the bimaristans included the following seven functional areas: Services and security areas, medical services, administration area, religious zone, educational zone, residential area, charitable services (Akram Muhammad Yahya, 2018).

Table 1. The main zones of the traditional bimaristans and their contents

Services zone/s	**Medical zone/s**	**Administrative zone**	**Religious zone**
Portals, doors, and walls surrounding the bimaristan. Control and guard rooms. Internal corridors. The foyer and the corridors of the Bimaristan and its bays. Kitchens, pantries, and food preservation. Baths and rest house. Stone clock tower. Vehicle parking.	Outpatient clinic. Iwan of Bimaristan. Pharmacy. Mortuaries and affiliated cemeteries.	Diwan of Bimaristan. (office) Manager office (Nezara).	Mosque.
Educational zone	**Residential zone**	**Charity zone**	**Recreational areas**
Medical schools. Library.	Residences for doctors, teachers, and workers. Residences for scholars	Watering, sabil, and Almzamliyah.	Courtyards. gardens

4. Comparative analyses between Egyptian and Syrian Bimaristans

This part of the study includes basic information - about those bimaristans – that must be collected in order to create an analytical comparison between those in Egypt and Syria. This allows us to select case studies from them. Those case studies that allow us to evaluate the analysis tool, which components were taken from the previous section of this study. This information includes the name of the bimaristan,

its founding date, the Islamic era in which it first emerged, the current construction state, and whether any architectural drawings have been documented for it that allow us to perform analyses.

4.1. Monitoring the status of Bimaristans in Egypt and Syria

4.1.1. Bimaristans in Egypt

Numerous references make it abundantly obvious that Egyptian society has a strong health care culture that dates back to ages before the Islamic eras (Metwaly et al., 2021). Consequently, the practice of medicine has continued to exist from the early Islamic era. In the beginning of the early Islamic era in Egypt, spaces were provided for it inside the mosques, because it was a public structure that attracted visitors from all over and was located in the center of the city (Hosney Radwan, 2021). Hence, up until the early Umayyad era, when the bimaristans arose as a center for healthcare. Then the bimaristans began to develop until they witnessed continuous flourishing, until Cairo became, in the twelfth century, a beacon for the countries of the East. It has annexed by schools of medicine. And it kept growing until the Ottoman era, when this building type experienced significant changes. The following table lists mentioned bimaristans in Egypt.

Table 2. A list of Egyptian bimaristans throughout the different Islamic eras

The Name of the Bimaristan	Construction Date	Islamic Era	Currently Construction Condition	Documented Architectural Drawings
Bimaristan Zoqaq El-Qanadil	a. 690 C.E.	Ummayid	Does not exist	X
Bimaristan Al-Maafer	a. 850 C.E.	Abbasid	Does not exist	X
The Ancient Bimaristan or The Supreme Bimaristan or The Tulunid Bimaristan	872 C.E.	Tulunid	Does not exist	X
The Lower bimaristan or Bimaristan Camphor Al-Ikhsheedi	957 C.E.	Ikhshidid	Does not exist	X
Bimaristan Al-Qashshin		Fatimid	Does not exist	X
Bimaristan Al-Saqqatiyin			Does not exist	X
The Nasserite bimaristan or El-Salahy or Bimaristan Salahuddin	1181 C.E.	Ayyubid	Does not exist	X
Bimaristan Alexandria	1181 C.E.	Ayyubid	Does not exist	X
El-Mansouri Bimaristan or Dar Rl-Shefaa or Marstan Qalawun	1284 C.E.	Bahriyya Mamluks	Exists and still operating as an ophthalmology hospital	√
Bimaristan Al-Moayyed	1421-1423 C.E.	Circassian Mamluk	Exists and is operating as a tourist attraction	√

According to the illustrated table (Table 2), the bimaristans built during the Mamluk era are still the ones that have architectural documentation, allowing for their study and analysis in the following section of the study.

4.1.2. Bimaristans in Syria

Agricultural policies like the Common Agricultural Policy of the European Union have been insensitive to the rural world's complex, multicultural and densely populated tapestry. A situation similar to the design

of new capitals that emerged in the mid-twentieth century with principles far removed from the local reality, such as Brasilia or Chandigarh. The project The City of a Thousand Cities by Perea (2012) was winner of the New Multifunctional and Administrative City for 500,000 inhabitants' competition in Korea. It makes an interesting reflection on preserving a large central productive agricultural space, and building around it a ring of intermediate cities, where citizens can interact without the need for a motor vehicle, and count on the presence of the landscape. Perea (2012) affirms that the complex and intense sustainable city is not a consequence of zoning, but of "meshing in space, function and building matter" and where the net sphere must be superimposed on the natural and urban spheres.

4.2. Analyses of the Bimaristans Elements in Egypt and Syria during the Mamluk's era

It was recorded that in Damascus hospitals existed as early as 706 CE at the time of Umayyad Caliph Al-Walīd. Several countries in the middle east witnessed the presence of bimaristans by that time but most of which were destroyed either totally or partially and the only traces of them are documented in the books of history. In Syria specifically there are main four Bimaristans that still exist nowadays, two of them are in perfect condition while the others are in deteriorated conditions. Two of them are found in Damascus while the others are in Aleppo. (Naqvi, N., 2012) The following table lists the four Bimaristans.

Table 3. Documentation of the most important Bimaristans in Syria

The Name of the Bimaristan	Construction Date	Islamic Era	Currently Construction Condition	Documented Architectural Drawings
The Nuri hospital, Aleppo.	12th century	Ayyubid	Deteriorated condition	X
The hospital Arghun Al-Kāmilī, Aleppo.	1354 C.E.	Mamluk	Well maintained and open for public witnessing frequent cultural events.	√
The Nūrī Hospital, Damascus.	1154 C.E.	Ayyubid	Well maintained and functions as a museum.	√
The Qaymārī Hospital, Damascus.	1248 C.E.	Ayyubid	Deteriorated condition	√

The crucial section of the study begins here, as the chosen case studies from the Bimaristans of Egypt and Syria are studied in accordance with the data compiled about them. Wherein their architectural components are analyzed in relation to design concepts derivate from Islamic culture and the elements of functional formation of Bimaristan. They were discussed in the study's earlier section.

4.2.1. El-Mansouri Bimaristan/Marstan Qalawun/ Dar El-Shefaa as an Example of Egyptian Bimaristans During Mamluk'd Era

Al-Mansour Qalawun, the seventh Mamluk sultan after the Mamluk emirs seized the throne from the Ayyubids of Cairo and established control of the greatest region of the Ayyubid Empire, inaugurated al-Bimaristan al-Mansour in 1285 C.E. Although Qalawun's complex included a madrasa, a bimaristan, and a mausoleum, the location of these buildings gave the bimaristan more prominence and emphasized its significance (Ragab, 2015).

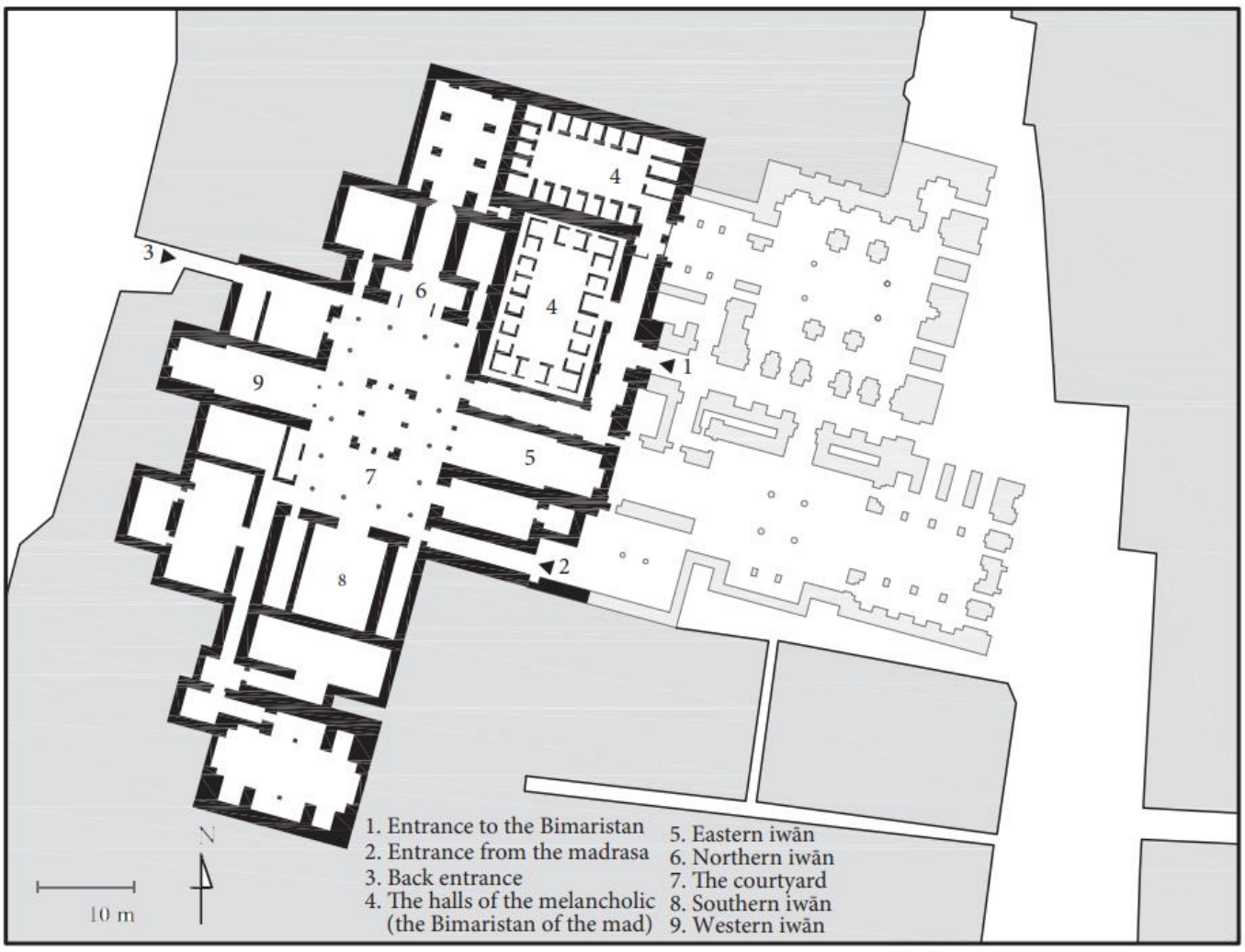
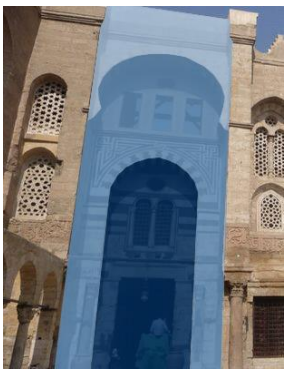
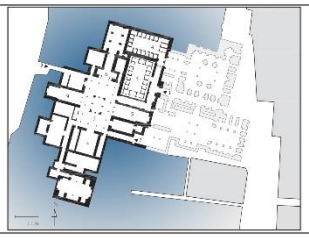
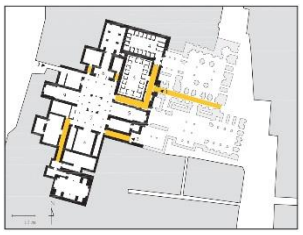


Figure 4. Floor plan of El-Mansouri Bimaristan. (Ragab, 2015)

Table 4. Analysis El-Mansouri bipartisan according to the main zones of the traditional bimaristans and their contents (Table 1)

Functional Zones	Architectural Elements	Location in Floor Plan
Services zone/s	Portals, doors, and walls surrounding the bimaristan. No entry immediately overlooks the main street; all entries are indirect. The mosque and mausoleum must be passed in order to access the main entrance. Two effects are obtained by treating the portal as a series of three layers. It does two things: first, it reduces the scale of the doorway as it climbs to the height of the building; second, it is a kind gesture that creates inward visual flow and strengthens the continuity between the street and the main corridor. The bimaristan is unenclosed by walls. Al-Nassir Muhammad Ibn Qalawun's complex is located on the northern side, and other structures can be seen on the southern side. Al-Mansur Qalawun's mosque and mausoleum are located on the eastern side, with a view of the front façade. While the bimaristan takes up the majority of the area of the complex. There is a western entrance that can be reached by passing through a passageway between the neighboring structures.	 The Portal of Qalawun complex. Layered entrance (by author, 2022)
	Control and guard rooms. Guard rooms for the building are not specified in the plan or mentioned in any references. However, we can see that the Bimaristan is hidden behind the school and the mausoleum and is completely surrounded by guarded structures.	
	Internal corridors. After passing through the gateway, the mausoleum, which was on the right/north, and the madrasa, which was on the left/south, both had windows that opened to the hallway, whose level was lower than that of both buildings. This created the effect of resembling the exterior street running up to the building in the corridor. At the further end of the corridor, facing one another, were the entrances to the mausoleum and the madrasa, which served as a signpost for the main corridor's end and the entry to the bimaristan. When approaching the building, a row of domes directed visitors to their left and then to their right along an L-shaped pathway, which in turn opened into the building's main courtyard next to the east iwan. The rather lengthy L-shaped pathway effectively blocked out street noise and gave the impression that there was only one little area within the bimaristan that was neatly organized. The patient or visitor would have	

travelled from the sunny street to yet another bright courtyard inside the hospital via the lengthy pathway between the mausoleum and the madrasa as well as the L-shaped corridor leading to the bimaristan courtyard.

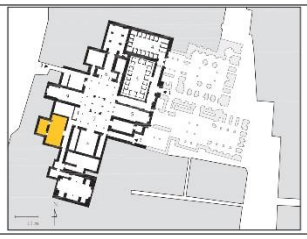
The foyer and the corridors of the bimaristan and its bays.

There would have been a big wooden gate at the start of the L-shaped domed corridor to the right of those entering the bimaristan, essentially forcing them to turn left along the L-shaped passage. The L-shaped passage continued straight behind the mausoleum, separating it from another area of the building that was divided from it by the gate. The section consisted of two halls, one of which opened onto the main corridor and had a door facing the back of the mausoleum; the other, which was entirely separate from the first, opened at the end of the corridor and had a smaller gate, and it was positioned perpendicular to the corridor so as to shield its occupants from view (Ibn Habib, 1976). That one serving men and the other serving women, these two halls were reserved for the melancholics (or the insane).

Ceiling and lighting system in the corridors (Saad, 2021)

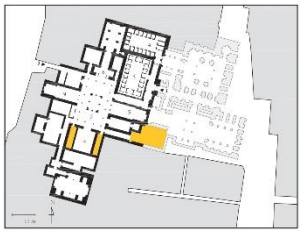
Kitchens, pantries, and food preservation.

Other than Pascal Coste (Troelenberg, 2015), who places the kitchen on a horizontal design, there are not enough sources to adequately describe the kitchen (Ragab, 2015).



Baths and rest house.

The floor plan makes it apparent where the restrooms for the Qalawun complex are located. The restroom for the school is at the Bimaristan's entrance, which is accessible from the school. For the Bimaristan, bathrooms which are separated into two sections flanking the southern Iwan, one for men and one for women, also has another area for servicing patients. The school's restrooms, which are positioned around an open courtyard, have received particular interest. Such composition to complete the cosmological Islamic concept.

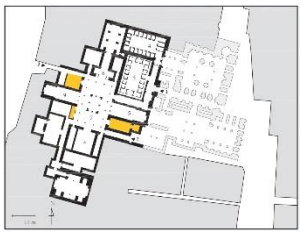
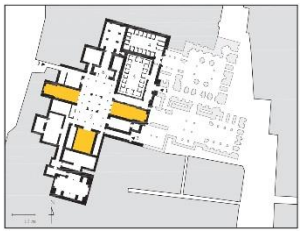
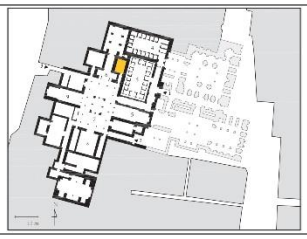
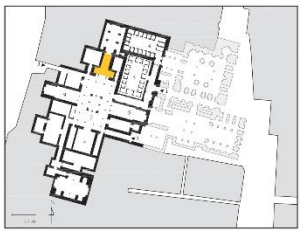
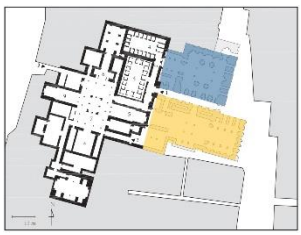


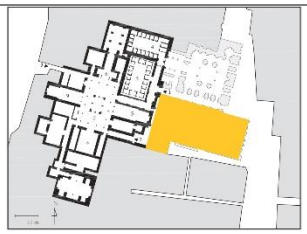
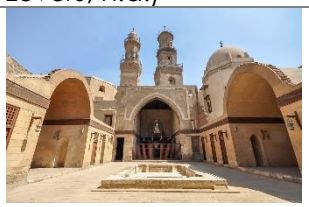
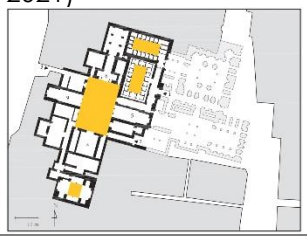
Stone clock tower.

Nothing on the site or in the literature suggests that this bimaristan has a clock tower.

Vehicle parking.

Nothing on the site or in the literature suggests that this bimaristan has a vehicle parking.

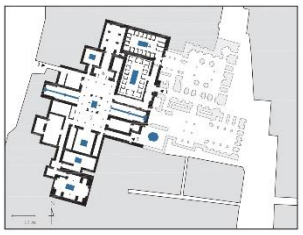
Medical zone/s	Outpatient clinic. Outpatient clinics are located near the entrances and around the courtyard. It is dedicated to ophthalmology and general surgery. Pharmacy. As for the room, which is located on the western side, near the back entrance of the Bimaristan, it is used to install medicines, as well as to support patients with quick medical advice.	
	Iwan/s of Bimaristan. There are four iwans in Bimaristan Qalawun. The eastern and western iwans are used as halls for convalescent men with beds. As for the southern iwan, it is used as a hall for male patients. As for the halls designated for women, they are located in the southern part of the main courtyard and its iwans, and private bathrooms for women are annexed to it. This is to provide the greatest degree of privacy for female inpatients.	
	Mortuaries and affiliated cemeteries A hall designated for ritual washing and encasing corpses. However, there is no proof that the Bimaristan is connected to a private cemetery.	
Administrative zone	Diwan of Bimaristan The front columns separating the northern iwan from the courtyard allow for visual connection. It is intended for the bimaristan's gradians and the nurses. There is a hall to the north of this iwan that might have been used for patients in intensive care. The physicians and employees accommodate in the next floors, which are accessible from this hall through a stairway. Manager office There is also a place reserved for the nazir (director) of the bimaristan in a corner of the courtyard.	
Religious zone	Mosque As mentioned above, this complex includes religious elements. The mosque, which is a religious element, has a significant area in the complex. It is of the iwan type mosques. Mausoleum There is also a mausoleum covered with a dominant dome on the facade of the complex. Only those religious elements overlook the main façade.	

Educational zone	The educational component was of particular significance in Qalawun complex. Where the sciences of jurisprudence and religion are taught, in addition to the sciences of medicine and pharmacy, due to the presence of the Bimaristan, which provides the practical part of the study. Like any other teaching hospital nowadays. The school is located in the upper floors of the mosque.	
Residential Zone/s	<u>Residences for doctors, and workers</u> The physicians and employees accommodate in the upper floors, which are accessible from the northern hall above the northern iwan through a stairway. <u>Residences for scholars</u> The mosque's upper floors house the school and the rooms where students and teachers accommodate.	 Entrance from the mosques's courtyard to the schools and accommodations (Nafees, 2021)
Charity zone	<u>Sabil</u> The whole complex is considered as a charity work. It serves religiously, educationally and medically. However, we can notice infront of the building a sabil. It was a basin for drinking animals, it was deep and paved. But Al-Nasser Muhammad rejected the ugly image of animals in front of this huge complex building, so he converted it into a water sabil for people. It is considered one of the oldest sabils after the sabil of the Zahiriya school.	 The Sabil at the entrance of the complex (*Qalawun Complex | Civilization Lovers*, n.d.)
Recreational zone	<u>Courtyards</u> In this complex, specifically, and in Islamic design in general, courtyards are a crucial component. As can be seen, the center of each zone in the bimaristan is an open courtyard. It aids in providing natural lighting and ventilation. This creates a sense of comfort for the patients and that they are not isolated or locked in a closed building. These yards usually contain plants and greenery, such as basil and plants that improve the psychological state of the patient and fasten the recovery process.	 Main courtyard in the bimaristan (Nafees, 2021) 

Fountains

Each courtyard has a water fountain. Which helps in the same mentioned process, as courtyards, and also completes the cosmological Islamic concepts.

There is a water fountain not only in the courtyards, but there are also some other areas that needed to be covered, such as the areas reserved for the care of female patients. It was designed so that the fountain is situated in the center of the space, in order to achieve the principle of centralization in Islamic architecture.



4.2.1. Araghun Bimaristan as an Example of Syrian Bimaristans During Mamluk's Era

Generally, in Syria, the sources that chronicled the history of medicine in the Islamic state mention that the first fixed hospital established in the Levant was in Damascus, and its establishment dates back to the caliph Al-Walid bin Abdul-Malik. Then the Bimaristan of Antioch, which was built by Al-Mukhtar bin Al-Hassan bin Batlan, who died in 1063 C.E. Then the great al-Nuri bimaristan built by the king "Nur al-Din Mahmud ibn Zangi" in Damascus.

1. Main entrance. 2. Main corridor (entrance lobby). 3. Central court. 4. Southern and Northern Iwans. 5. Corridor. 6. Corridor. 7. Service entrance corridor. 8. A main unit consisting of rooms. 9. Another unit consisting of eleven small rooms. 10. Court.

Figure 5. Floor plan of Arghun Bimaristan Aleppo, Syria (Asslan, 2023)

In this section, we analyse a historical mediaeval hospital called Arghun Al-Kamli (Figure 5) or Bimaristan al-Arghuni, also known as Argun Bimaristan or Arghun al-Kamili Bimaristan, is situated in Aleppo, Syria. It was constructed in 1354 C.E.by Arghun Al-Kamli, the Mamluk sultanate's representative in Aleppo. The bimaristan has three primary wards: one is for serious cases, one is for cases of common diseases, and one is designated for ladies and also has a portion for convalescence. The historic city of Aleppo, which

includes the Bimaristan of Arghun Al-Kamli, one of the most significant hospitals ever constructed in the Islamic world, was included as a UNESCO World Heritage Site in 1986 C.E. (Abou-Saleh & Salloum, 2020).

Table **5** includes the architectural analyses of Arghun bimaristan at Apollo.

Table 5. Analysis El-Arguni bipartisan according to the main zones of the traditional bimaristans and their contents (Table 1)

Functional Zones	Architectural Elements	Location in Floor Plan
Service/s	 <u>Portals, doors, and walls surrounding the bimaristan.</u> Main entrance on the main road leading to the entrance lobby which apart from its role in inner circulation was also used for patients and inspection and medicines distribution. The entrance is protected by a wrought iron fence. Islamic ornaments on the main entrance facades (Nizamoglu, 2012)   (David & Degeorge, 2002) An internal door covered in ornamented copper sheets. <u>Service entrance</u> on the lower right side of the plan leading to the main service corridor which intersects with the above-mentioned corridor in a covered squared lobby.	 

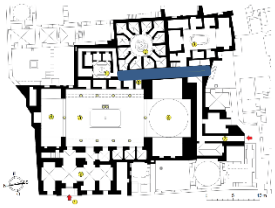
Control and guard rooms.

Guard rooms for the building are not specified in the plan or mentioned in any references.

Internal corridors.

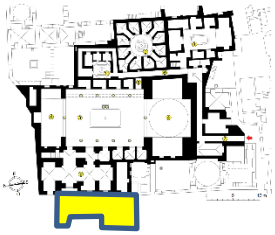
Small corridor on the upper right side of the court leading to the internal zones specialized in medical uses, accommodation, and services.

Main corridor reached from the above mentioned one and leads to the three main zones specialized in medication and accommodation.



The foyer and the corridors of the bimaristan and its bays.

The main entrance lobby leading to the central court was being used for patients' inspection and distributing medicines among non-resident patients (pharmacy).



Kitchens, pantries, and food preservation.

On the right side of the plan next to the service entrance, linked with other zones through the service corridor.

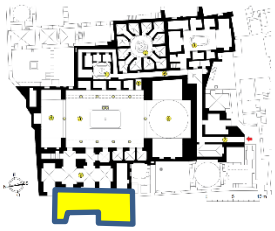
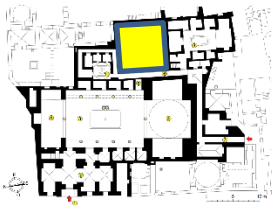
Baths and rest house.

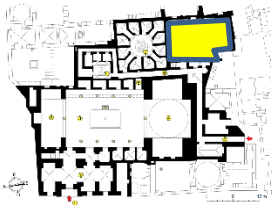
There is not enough data documenting their location.

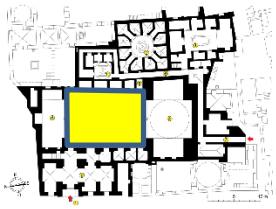
Stone clock tower.

Nothing on the site or in the literature suggests that this bimaristan has a clock tower.

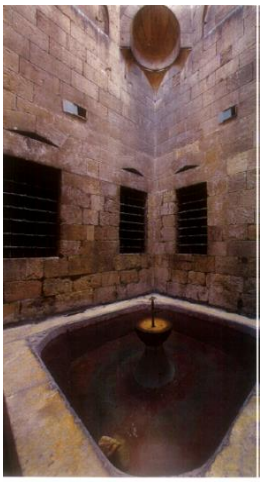
Vehicle parking.

	Nothing on the site or in the literature suggests that this bimaristan has a vehicle parking.	
Medical zone/s	Outpatient clinic. The main entrance lobby leading to the central court was being used for outpatients' inspection and	
	Pharmacy. The main entrance lobby leading to the central court also played the role of a pharmacy distributing medications among non-resident patients.	
	Iwan/s of Bimaristan. The two Iwans were used for several functions among which was for organizing meetings. (Naqvi, N., 2012)	
	Mortuaries and affiliated cemeteries There is not any evidence on the presence of either of them.	
	Five treatment rooms accessed through a rectangular central court having a water fountain in its center.	
	Nine small treatment rooms with a central court with a water fountain in its center.	
	Accommodation zone consisting of a central court with a centralized water fountain and four accommodation rooms overlooking the court through windows covered with steel mesh, the four rooms are not accessed from the court but through the surrounding corridor on the outer perimeter of the four rooms. This zone was devoted to patients with psychological or mental problems. The court is covered with a dome having a square wide	

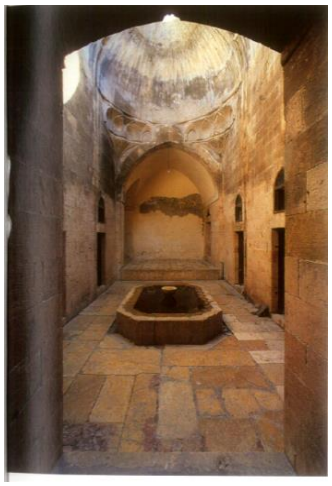
	opening. (Naqvi, N., 2012)  Steel mesh covering accommodation rooms' windows overlooking the court. (David & Degeorge, 2002)	
Administration	<u>Diwan of Bimaristan</u> <u>The two Iwans</u> were used for several functions among which was for organizing meetings. (Naqvi, N., 2012)	
	<u>Manager office</u> This area played several roles among which was arranging meetings within it. (Naqvi, N., 2012) But still the manager's office is clear whether existed or not.	
Religious zone	<u>Mosque</u> No evidence.	
	<u>Mausoleum</u> No evidence.	
Educational zone	The two Iwans played also an educational role in the building. (Naqvi, N., 2012) This central court and surrounding rooms were reportedly used in educational functions. (Naqvi, N., 2012)	 

Residential zone	Residences for doctors, and workers Not defined.	
	Residences for scholars Not defined.	
Charity zone	Sabil There is no evidence of its presence, but the whole building could be considered as a charity zone because it provided medical and educational facilities free of charge for all clients regardless to their origins or status.	
Recreational zone	 Courtyards A large central open courtyard with a centralized rectangular water fountain, leading to two Iwans which are covered with domes (David & Degeorge, 2002). A composition that reflects clearly the influence of Islamic Architecture being explained in the previous section of the research. The two Iwans were reportedly used in several functions among which were recreational activities as playing music and singing as it was well known in Arabic culture that music was used for treating some sorts of diseases. (Naqvi, N., 2012) Three other smaller courts with central fountains are the main core of the three treatment zones. The main central court with aisles and water fountain (David & Degeorge, 2002)	 

Fountains



Water fountain in the center of the court (David & Degeorge, 2002)

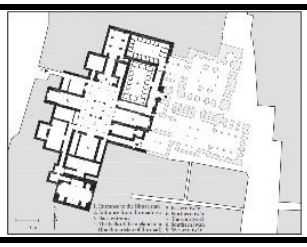


Internal court with a centralized water fountain.(David & Degeorge, 2002)

5. Results

From the previous analyses we can stand on a number of results. The chosen Egyptian case-study was built after that from Syria. Accordingly, the founder considered some elements that was missing in the Syrian bimaristan. That in addition of political and economic reasons. The following table illustrates the between El_Mansouri bimaristan at Egypt and El-Arguni Birmaristan at Syria.

Table 6. The difference between El_Mansouri bimaristan at Egypt and El-Arguni Birmaristan at Syria according to the architectural principles of designing traditional bimaristans in Islamic communities

			
Services zone/s	Portals, doors	√	√
	walls surrounding	X	X
	Control and guard rooms	X	X
	Internal corridors.	√	√
	The foyer and the corridors of the Bimaristan and its bays.	√	√
	Kitchens, pantries, and food preservation.	√	√
	Baths and rest house.	√	X
	Stone clock tower		
	Vehicle parking.		
Medical zone/s	Outpatient clinic.	√	√
	Iwan of Bimaristan	√	√
	Pharmacy.	√	√
	Mortuaries and affiliated cemeteries.	√	X
Administrative zone	Diwan of Bimaristan (office)	√	X
	Manager office (Nezara).	√	X
Religious zone	Mosque	√	X
	Mausoleum	√	X
Educational zone	Medical schools.	√	X
	Library.	√	X
Residential zone	Residences for doctors, teachers and workers	√	X
	Residences for scholars	√	X
Charity zone	Watering, sabil, and Almzamliyah.	√	X
Recreational areas	Courtyards.	√	√
	Gardens	X	X
	Fountains	√	√

From this table we can notice that the service zones in both bimaristans are almost equal. Both of them didn't include security walls or boundaries or guard rooms. Since each of them derived the element of protection from the being adjacent to other buildings of importance. Therefore, the fronts of the bimaristans were not directly overlooking the streets, and therefore were not exposed to any direct attack.

The presence of a tower clock on one of the Bimaristan's wall towers served to identify the Islamic Bimaristans. Usually, it was located at the main entrance, like the minaret for the mosque. Where it was erected, to remind the times of prayer and working hours and official works within the Bimaristan.

Additionally, given how crucial it is for patients to receive medication and therapy in accordance with the doctors' recommendations, it is vital to know the precise time (Akram Muhammad Yahya, 2018). However, the study reveals that the bimaristans that were examined and studied for this research lack this stone clock tower as an architectural feature. This is most likely caused by the fact that the bimaristan is a part of a larger structure that includes a mosque. Large minaret in this mosque provides the same function, and locals are aware of the appropriate times for their diverse needs.

The only difference between the two case studies in the service zone is the absence of rest rooms in the Syrian bimaristan, despite, bathrooms are important because the Islamic culture requires and enforces their constant hygiene, so that believers can perform the other aspects of devotion. This is in addition to the fact that bathrooms are vital for hygiene and sanitation purposes in the bimaristan.

Also, bimaristan Argun did not include an area for ritual washing for dead bodies, however this service is provided in the Mansouri bimaristan. The service of ritual washing for dead bodies, as well, must had been provided in another structure nearby the place.

In addition, we can notice that administrative, religious, educational, residential and charity zones are not considered in Argun bimaristan, while they are considered in El-Mansouri one.

Concerning recreational areas both of them included, where they have open courtyards and water fountains, but both of them missed open gardens. However, they used greeneries inside the courtyards.

From the cosmological point of view, we can notice that the design of both bimaritans followed the spiritual and cultural aspects of Islamic communities. Both buildings are iwan type building that achieve unity and multiplicity principle. Also, they used courtyards as the core of central point for the internal zones. Eventually, we can claim that both of them can be considered as a model of the domestic Islamic architecture.

6. Discussion

The purpose of the study was to study the architecture of bimaristans in communities that adopt Islamic culture, by making a comparative analysis between that in Egypt and in Syria during the Mamluk's era. That building type, in the studies of traditional Islamic architecture is very few. This paper focused on Egypt and Syria because those illustrated case studies are documented and still intact. The methodology helped in reaching the findings by introducing the mentioned or studied bimaristans to choose from them the most suitable case studies. Then, introduced the elements that mostly included in that building type. Finally, compare between those architectural elements from the formal point of view and justify points of similarities or differences.

From the previous architectural analyses of the bimaristans *Al-Mansouri* and *Argun,* that were built during the Mamluk's Era, we can notice obviously that both of them were following an architectural prototype, similar to that mentioned by Akram Yahya (Akram Muhammad Yahya, 2018). Such a prototype is a reflection of the impact of the Islamic culture of both communities. For example, considering having a core or center to achieve the idea of interiorization in Islamic architecture. This core is surrounding by iwans, and iwans are surrounded by the functional spaces to achieve the idea of unity and multiplicity in Islamic architecture (Gabr, 1992). However, each of Egypt and Levant has it own architectural character that cast it shadow in their bimaristans. That appears on the detailed architectural elements more that the form of the building as a whole. For instance, the domes see Figure 6, we can notice from the interiors that the dome in Syria still influenced by the roman characteristics. The dome in Arghun bimaristan is semicircular with an oculus in the top middle. That feature cannot be seen in the Egyptian territory. However, structurally wise the architect used tiered squinches to transfer the squared space into a circular cover. That treatment flourished during the Islamic consequent eras especially since the Ayyubid dynasty. Here we can physically distinguish the Islamic cultural influence on the layers of civilization that passed by Syria.

Such details confirm that each Islamic region keeps beneath its details its regional features and forces of influence that formulate its architecture.

From another point, many academics believe that Bimaristan al-Mansouri was placed behind the mosque and mausoleum because of political considerations. They explain that the founder was determined that the bimaristan be linked with name as a charitable institution, in order to enhance his political influence both while he was alive and after his passing. Without sacrificing any of the façade's significant political importance, the bimaristan would be annexed to his cemetery and school. In their perspective, it was not a coincidence that the bimaristan was hidden behind the mausoleum and the school; rather, it was done with political purpose. No one would be able to enter the bimaristan without first passing through the school and the mausoleum (Rabbat, 1992).

(a) ("Sultan Al-Mansur Qalawun Collection," 2023)

(b) Interior of the dome (by author, 2017)

Figure 6. (a) the dome of El-Mansouri complex, (b) the dome of Arghun bimaristan.

While the designer's technique supplied the factors of safety and calm, which are typically considered in Islamic bimaristans. The technique is to completely surround the Bimaristan with less significant structures, with no emphasis whatsoever placed on the entrances.

Concerning missing the rest rooms in Argun bimaristan, this is a very strange information, and our assumption is that, either it already exists but has not been registered, or there is a nearby bath area that serves the Bimaristan, or this point was not taken into account in the design of this building.

That theories provide practicians and scholars in Arabian or Islamic communities with the architectural tools from the traditional treatments whether for the building as a whole or its details. Architects who work with such communities

7. Conclusion

During the course of this investigation, information collection proved quite challenging due to the dearth of references addressing the architecture type of bimaristans. Many of them also physically vanished owing to environmental and social circumstances, in addition to their bodily departure.

On the other hand, in order to chronicle what has been destroyed as a result of environmental and human factors, research into the history and architecture of bimaristans must be expanded, especially in terms of tracing their archeological traces. Consequently, it can be examined, analyzed and creative hypotheses can be drawn to support historical, and architectural research can be developed.

From this analysis we can state that the bimaristans in Egypt and Syria have their prototype, unless each territory keeps between its architectural elements details that reveal its identity and tell about each layer of civilization that this region passed through. This research is considered as a piece of puzzle in the field of research concerning the architecture of Islamic bemaristans. This field needs efforts for documenting architecturally bimaritans that demolished, however described and mentioned by many historians. We need to make a reconstruction for each of them. Also, by comparing between bimaritans in different regions in the Islamic world that helps to complete the picture of this place that time, recognize and link more circumstances that occurred.

Studies concerning the existing bimaristans, need to be more precise, as we assume that there are some zones must have been considered in Argun bimaristan but not documented.

Contemporary architects, who deal with this type of heritage building, must take into account what has been mentioned regarding the initial principles of design, which have been extrapolated from what has been inherited through different eras, taking into account the cultural and social aspects, when making any renovations for the continued use of the building.

Acknowledgements
A preliminary version of this paper was presented at 6th International Conference on Contemporary Affairs in Architecture and Urbanism in the form of an oral presentation.

Data availability statement
The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

Ethics statements
Studies involving animal subjects: No animal studies are presented in this manuscript.
Studies involving human subjects: No human studies are presented in this manuscript.
Inclusion of identifiable human data: No potentially identifiable human images or data is presented in this study.

Conflict of Interests
The author declares no conflict of interest.

References

Abdelaal, M. S., & Soebarto, V. (2018). HISTORY MATTERS: THE ORIGINS OF BIOPHILIC DESIGN OF INNOVATIVE LEARNING SPACES IN TRADITIONAL ARCHITECTURE. International Journal of Architectural Research: ArchNet-IJAR, 12(3), 108. https://doi.org/10.26687/archnet-ijar.v12i3.1655

Abdullah, K. (2012). Bimaristans in the city of Nablus. Manifestations of the movement of history in the city of Nablus, Nablus.

Abou-Saleh, M. T., & Salloum, I. M. (2020). Bimaristan Arghun Al-Kamili in Aleppo, Syria: A Mental Hospital with Unique Architecture Designed to Meet Patient Need in Medieval Islam (1354 AD) = (1354 م) بيمارستان أرغون الكاملي في حلب، سوريا : مستشفى عقلي بهندسة معمارية فريدة في الإسلام في العصور الوسطى. **The** Arab Journal of Psychiatry, 31(2), 191–195. https://doi.org/10.12816/0056870

Akram Muhammad Yahya, H. (2018). Common architectural characteristics in the planning of Bimaristan and its development in the Arab and Islamic eras. University of Mosul, College of Archeology, 3(2), 187–223.

Alansari, A., & Hirao, K. (2017). The Impact of Bimaristans Design on Design Factors of Therapeutic Buildings: An Environmental Field Study in Makkah, Saudi Arabia. مجلة التصميم الدولية, 7(2), 59–66. https://doi.org/10.12816/0046552

Al-Kubaisi, F. M. (2006). From the outputs of Islamic civilization: Bimaristan hospitals. The Ministry of Awqaf and Islamic Affairs, Kuwait. https://search.mandumah.com/Record/448682

Asslan, H. (2023). Alep (حلب). under printing.

Bayt Al-Suhaymi ("House of Suhaymi"). (n.d.). Retrieved June 6, 2023, from https://egymonuments.gov.eg/monuments/bayt-al-suhaymi-house-of-suhaymi/

Behrens-Abouseif, D. (1992). Islamic architecture in Cairo: An introduction (2. impr). Brill.

Behrens-Abouseif, D. (2007). Cairo of the Mamluks: A history of the architecture and its culture. The American University in Cairo Press.

Belakehal, A., Tabet Aoul, K., & Bennadji, A. (2004). Sunlighting and daylighting strategies in the traditional urban spaces and buildings of the hot arid regions. Renewable Energy, 29(5), 687–702. https://doi.org/10.1016/j.renene.2003.09.001

David, J.-C., & Degeorge, G. (2002). Alep. Flammarion.

El-Baba, M. (2009). Islamic Bimaristans until the End of Abbasid Caliphate [Maters]. Islamic University - Gaza.

Elyan, R. M. (2002). Bimaristans—Hospitals—In the Arab Islamic Civilization. Zarqa University, 2(7), 49–54.

Gabr, A. (1992). The Influence of Traditional Muslim Beliefs on Medieval Architecture: A Study of the Bahari Mamluk Period [Ph.D.]. Edinburgh University Press.

Hosney Radwan, A. (2021). The role of the mosque as a public space in the Islamic city, an analytical study of the architecture and urbanization of some contemporary models. Journal of Architecture, Arts and Humanities, 0(0), 0–0. https://doi.org/10.21608/mjaf.2020.35199.1712

Ibn Habib, A.-H. (1976). Tadhkirat al-Nabīh fī Ayyām al-Manṣūr wa Banīh (M. M. Amin & S. Ashour, Eds.; Vol. 1). Egyptian General Book Organization.

Maraqa, S., Moeseke, G. V., & De Herde, A. (2014, 8/5). Thermal and Ventilation Performance Assessment in Traditional Islamic Hospitals Based on Computational Fluid Dynamics Simulation, Case Study: Bimaristan Al-Qaimari—Damascus. 7th International Conference on Thermal Engineering: Theory and Applications, Marrakesh-Morocco. https://www.researchgate.net/publication/264158386_Thermal_and_Ventilation_Performance_Assessment_in_Traditional_Islamic_Hospitals_Based_on_Computational_Fluid_Dynamics_Simulation_Case_Study_Bimaristan_Al-Qaimari_-_Damascus

Metwaly, A. M., Ghoneim, M. M., Eissa, Ibrahim. H., Elsehemy, I. A., Mostafa, A. E., Hegazy, M. M., Afifi, W. M., & Dou, D. (2021). Traditional ancient Egyptian medicine: A review. Saudi Journal of Biological Sciences, 28(10), 5823–5832. https://doi.org/10.1016/j.sjbs.2021.06.044

Nafees, I. (2021, May 10). Qalawun complex in Cairo: Iconic Monuments of Cairo. RTF | Rethinking The Future. https://www.re-thinkingthefuture.com/2021/05/10/a4112-qalawun-complex-in-cairo-iconic-monuments-of-cairo/

Nizamoglu, C. (2012, January 23). Four Medieval Hospitals in Syria. Muslim Heritage. https://muslimheritage.com/four-medieval-hospitals-syria/

Rabbat, N. (1992). Architectural Terms in Mamluk Documents, by Laila Ibrahim and M. M. Amin. 139 pages, 15-page English summary. American University in Cairo Press, Cairo1990. Middle East Studies Association Bulletin, 26(1), 112–113. https://doi.org/10.1017/S0026318400025396

Ragab, A. (2015). The medieval Islamic hospital: Medicine, religion, and charity. Cambridge University Press.

Ragab, A. (2009, July). Bīmāristān al-Manṣūrī: State and Medical practice in Mamluk Egypt (1285-1390). The twenty-third Congress of History of Science and Technology, Budapest. https://dash.harvard.edu/handle/1/4726203

Riva, M. A., & Cesana, G. (2013). The charity and the care: The origin and the evolution of hospitals. European Journal of Internal Medicine, 24(1), 1–4. https://doi.org/10.1016/j.ejim.2012.11.002

Saad, A. (2021, 93). The story of a place: Bimaristan Qalawun, the first college of medicine and pharmacy in Egypt. Elmadar. https://www.elmadar.com/tourism/2021/09/03/14044/

Sherif Kaf, A.-G. (2007). The Origin of Bimaristans (Hospitals) in Islamic Medical History. Foundation for Science, Technology and Civilisation FSTC. https://muslimheritage.com/uploads/The_Origin_of_Bimaristans_in_Islamic_Medical_History.pdf

Troelenberg, E.-M. (2015). Drawing Knowledge, (Re-)Constructing History: Pascal Coste in Egypt. International Journal of Islamic Architecture, 4(2), 287–313. https://doi.org/10.1386/ijia.4.2.287_1