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## Anatolian Seljuk Hospitals and Divriği Example

### Anadolu Selçuklu Hastaneleri ve Divriği Örneği

#### ABSTRACT

The Anatolian Seljuk State in the period 1078-1308 was very rich in cultural life and building activities. Some of the remained architectural buildings include hospitals which are understood as healing centres of the Middle Age period. The architectural and acoustic characteristics of the hospitals revealed the specificity of design suitable for healing purposes with the emphasis Divriği hospital and on the makam's produced sound events and dependency on the Turkish traditional concept of a healing. In this text the short introduction of the formation of Anatolian Seljuk State is given, and the overview and comparison of four hospitals that were part of the research. The results of the acoustic analysis conducted on the Divriği hospital is one representative sample of such architectural concept.

**Keywords:** Seljuks, Anatolia, Middle Ages, hospitals, healing, acoustic analysis

#### ÖZ

Anadolu Selçuklu Devleti 1078-1308 döneminde kültürel yaşam ve imar faaliyetleri açısından oldukça zengindir. Günümüze gelebilen mimari örneklerden bazıları, Orta Çağın şifa merkezleri olan hastaneleri de içermektedir. Hastanelerin mimari ve akustik özellikleri, makamların ürettiği seslerin vurgulandığı ve geleneksel şifa anlayışına bağlı kalarak şifa amacına uygun tasarım özgünlüğüne sahip olduklarını göstermektedir. Bu metinde, Anadolu Selçuklu Devleti'nin oluşumu ve yöneticileri hakkında kısa bilgiler verilmekte ve incelemeye dahil edilen çeşitli hastaneler hakkında genel bilgileri verilmiştir. Özellikle Divriği Darüşşifası'nda yapılan akustik analiz sonucu, bu mimari konseptin temsili örneklerinden birini oluşturmaktadır.

**Anahtar Kelimeler:** Selçuklular, Anadolu, Orta Çağ, darüşşifalar, tedavi, akustik analiz

## Introduction

The Anatolian Seljuk state was founded in Iznik after Manzikert battle in 1078 and was ended in 1308.

The boundaries were Byzantine Empire on one side and Great Seljuk Empire on the other side, positioning Anatolian Seljuk State on the crossroad of these two empires (see Fig.1).



**Fig. 1.** Anatolian Seljuk State borders, illustration by I. Mihaljinec

For almost 2 centuries many families exchanged on the throne and sometimes even more than one ruled. Altogether there were 17 sultans. Some of them were more productive in construction, that depended on the conditions within the state. Some sultans were more in favour of construction activity while the others were more interested in quests.

The sources of historical texts regarding foundation are limited but physical evidence is a solid resource to learn what was in the past and make some conclusions. The buildings that remained from the Anatolian Seljuk period are inexhaustible sources for research as this was a dynasty very rich in cultural life and building activities.

The first ruler was Rükneddin Süleyman Şah I who came all the way to Üsküdar (Kommene, 1996, p, 124). He set up customs offices in Iznik and started taxing ships which were going through Bosphorus (Turan, 1993, p.61). He was familiar with astronomy and the reign was based on the principle of tolerance.

In the period after conquering Antakya, he permitted Christian community to build churches of St. Mary and St. George (Turan, 1993, p.79). Also, to preserve social peace, he acclaimed collective amnesty during the Antakya quest. The main characteristic of his regnal period was change in the division of land property, where he gave land properties and freedom to the people which simplified integration of local population, so the later sultans followed his example. In this way, prosperity and welfare of the people increased (Turan, 1993, p.56,79).

In general, the organization of the Anatolian Seljuk state is like a sequel of the organization of the Great Seljuk state. Although they were connected in the beginning, since 1092 Anatolian Seljuks became independent, and the state is divided among the governors (Ibn Bibi, 1996, p.31-2) which leads to certain problems in the country. As regnal symbols they used flag, *çetr* (round element that look like umbrella, and eastern rulers were wearing as a hat) and *nevbet* (military band who performed on specific places in a specific time) (Jasienski, 2014, p.192)<sup>1</sup>. The Abbasid Caliphs from Baghdad, with the fermans/proclamations with which they confirm the power and administration of the sultan, also send *hil'at*, turban and cane<sup>2</sup>. Regarding this subject, period of Izeddin Keykavus I and Alâeddin Keykubad I is very interesting. According to Ibn Bibi (1996, p.150), Abbasid Caliph sent symbols and clothes of the *Futuvvet* organization (a sort of fraternal organization) to İzzeddin Keykavus I.

Anatolia was divided between four branches in the beginning – Mengujecks, Danishmends, Saltukids and Artukids, and each of them ruled their part or region (see Fig.2).

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<sup>1</sup> *Çetr* – round element resembling an umbrella which Eastern rulers wear on the head, a symbol of power; *Nevbet* – military music and a band, which performed in specific places in specific time; sancak-flag (Sözen and Tanyeli, 1986).

<sup>2</sup> As Jasienski points out, “*hil'at* is a robe of honour, a richly embroidered kaftan which was given to foreign diplomats”.



**Fig. 2.** Anatolian in the 12<sup>th</sup> – 13<sup>th</sup> century, illustration by I. Mihaljinec

Danishmend branch included cities Tokat and Niksar where the first madrasas with the dome were built in the Anatolia by architect Yağbasan (Kuran, 1969, p.11-2.; Aslanapa, 1984, p.135). Also, the first copyrighted book was presented in 1103 to Ahmed Gazi where he is mentioned as the guardian of Kayseri and where his quests into Byzantium, Armenia and Syria were described. The book was entitled *Keşfu'l-Akabe* and was written by author İbnü'l Kemal İlyas b. Ahmed from Kayseri (Bayram, 1979, p.32).

Artukid branch was in the southeast of Anatolia, where in the cities Mardin and Kızıltepe the construction was the second largest in the Anatolian Seljuk state. Kızıltepe was important place on the trade route to Iraq, Syria and Egypt, so it became a central place of international fairs where merchants from Anatolia, Syria and Diyarbakir gathered and traded. Because of this many madrasas, baths and bazaars were built (Sevim & Yücel, 1989, p.215). The land of Artukids became a place for annual pilgrim caravans and merchants from Ahlat, Erzurum, Caucasus, Azerbaijan and Iran (Turan, 1973, p.208-9) and as a result of these activities, in the period 1108-1122 Eminateddin Külliyesi, a first building complex in Anatolia which included hospital, was built in Mardin. Geographer Idrisi in 12<sup>th</sup> century and Marco Polo in 13<sup>th</sup> century describe silk fabric, handkerchiefs and knitted ribbons which were exported from Silvan and were highly appreciated in Islamic countries, as well as cotton and cotton fabrics, including *buharin* cloth which was manufactured in Mardin (Turan, 1973, s.210.; Marco Polo, 2004, p.45).

The bridge in Hasankeyf across Tigris was important for the merchants, so the Khalif from Baghdad had it built in 1174 and bought the material from city named Hani in value of 1500 golden denars (Mihaljinec, 2021, p.23). The Artukid area also had copper mines, so Timurtaş minted the first copper coins in 1147. It is interesting that Sunni Artukid's money had Christian figures. On the coins, figures of rulers, victorious god, Jesus and angels are presented<sup>3</sup>. Human figures can relate to the trade with Byzantine Empire. Manufactured goods were exported to Mosul and Baghdad. Economic independence and prosperity were preserved during the crusades, and part of the money was invested in culture so many monuments were preserved until today. Istanbul library holds part of the documentation from Artukid times which shows they had rich cultural life, including divans in Arabic, construction logs and halal *fatwas* for wine (Turan, 1973, p.223).

The Mengüjeck branch was governing Erzincan, Kemah and Divriği and had a great construction activity. Beside construction activities, their first ruler Behram Şah (1117-1187) was the first to mint the coins (Artuk and Artuk, 1971, p.387, No: 1188-1191). The reign of Şehin Şah in Divriği (1162-1198) is also marked with a rich construction activity (Cahen, 1979, p.120). The architect *Maragalı Hasan bin Firuz* built Kale Mosque<sup>4</sup> (1180-1181) and *Tut Beğ bin Behram* built one tomb in 1196 for Şehin Şah, today known under the name *Sitti Melik*<sup>5</sup>.

One of the best examples of the hospital is Divriği Great Mosque and Hospital (see Fig. 3), built by Mengüjeck sultan Ahmet Şah and his wife Melike Turan in 1228–29. A monument is under the protection of UNESCO and a World Heritage site since 1987. Because of its architectural structure as a medieval healing centre<sup>6</sup> it was used for the acoustic research.<sup>7</sup>

<sup>3</sup> Artuk and Artuk 1971, 390-407, No: 1197, 1201, 1202, 1204.

<sup>4</sup> For more information on building of the Kale Mosque in Divriği see Mayer, 1956, p.67.; Sönmez, 1989, p.157-159.; Bayburtluoğlu, 1993, p.117.; Eser & Acara Eser, 2018.

<sup>5</sup> For more information on building of the Sitti Melik tomb see Mayer 1956, p.69.; Sönmez, 1989, p.160-161.; Bayburtluoğlu, 1993, p.138-140.

<sup>6</sup> As pointed by Çoban (2006, p.54) and Giray (2008, p.47) it was one of the centers on Anatolian plateau where music therapy was conducted.

<sup>7</sup> The research has been conducted by Ivana Mihaljinec for the purpose of doctoral thesis, Music as healing in the Anatolian Seljuk Times (2021).



**Fig. 3.** Divriği Great Mosque and Hospital, photo by I. Mihaljinec

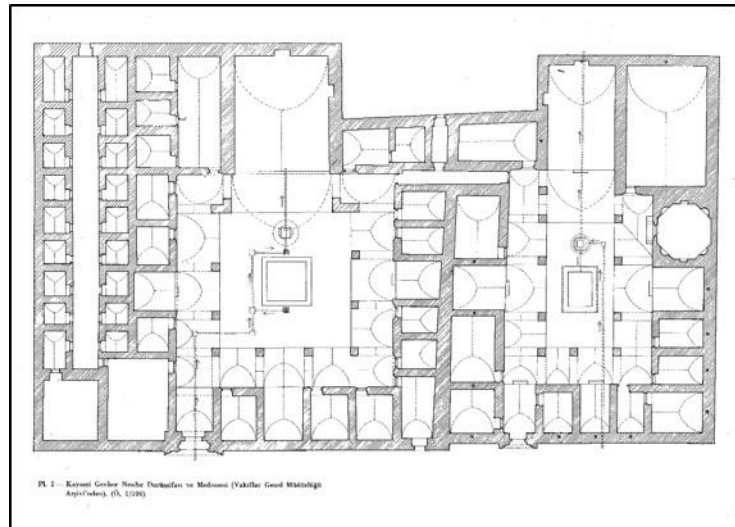
Generally, hospitals in the Anatolian Seljuk period were built according to the madrasa plans (Mihaljinec, 2021, p.39). Medical education in the Seljuk period is relatively developed considering the conditions. Even the Christian doctors who joined Crusades claimed they learned a lot from Muslim doctors and their way of patient treatments (Terzioğlu, 1972, p.52.; Mihaljinec, 2021, p.39). It is important to emphasize that hospitals built during the Seljuk and Ottoman period differ from medical care buildings in the rest of the world. The hospitals constructed in the Middle Age period had a priority in improving the mental disorder patients' state of health by using the treatment with music sound and water, a therapy known from the Roman times (Mihaljinec & Eser, 2022, p.67).

In the research conducted for the purpose of doctoral thesis (Mihaljinec, 2021), nine hospitals were taken into consideration for which was believed that had practice of music therapy and healing with music, and its connection with the architectural style. These hospitals were Eminateddin Hospital in Mardin, Gevher Nesibe Hospital and Medical School in Kayseri, Izeddin Keykavus Hospital in Sivas, Turan Melike Hospital in Divriği, Atabey Cemaleddin Ferruh Hospital in Çankırı, Pervaneoğlu Alı (Yılanlı) Hospital in Kastamonu, Muineddin Pervane Hospital in Tokat, Anber bin Abdullah Hospital in Amasya and Aksaray Hospital.

For this paper four hospitals are described and compared.

The Gevher Nesibe hospital in Kayseri (1205-06) was built under the patronage of Giyaseddin Keyhüsrev I. This is the first example of a hospital built in Anatolia and it is the most preserved one. The west part of the complex was a hospital, while the medical school was in the east part. The income of the hospital was ensured through *vakfiye* which included several estates, hamams and arable land. According

to Inan (1993, p.3), the complex was used for therapy and education. It had rooms for physicians, surgeons and ophthalmologists, as well as wards for patients with mental disorders (see Fig. 4)<sup>8</sup>. Left from the main iwan was a unit used for the treatment of mental disorders. Acoustic sound channels, accompanied by the sound of music and water are positioned between the walls, forming a unit which consisted originally of 18 small rooms<sup>9</sup>.



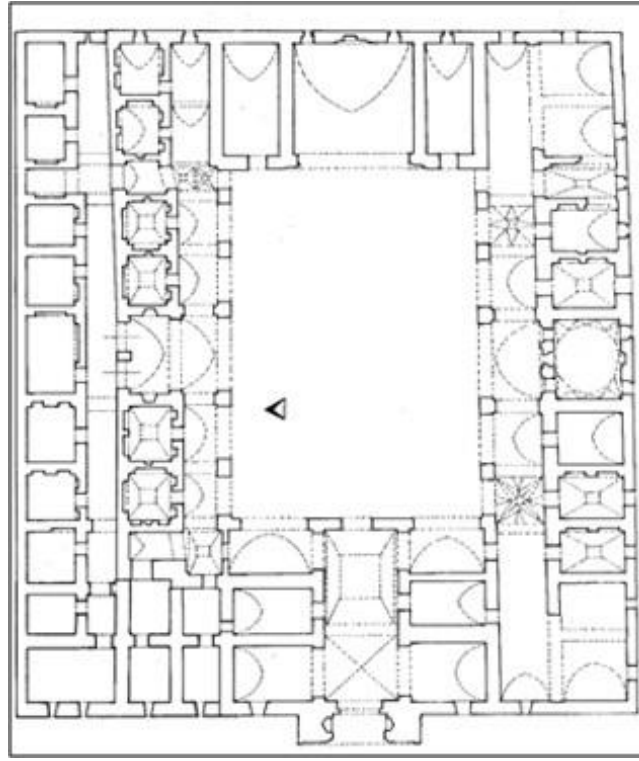
**Fig. 4.** Gevher Nesibe Hospital plan, Cantay 1992, plan 2.

The Izeddin Keykavus hospital, according to the inscription above the door (Bayat, 2006, p.355-6), was commissioned and built by sultan in Sivas (1217-8). The rectangular shaped hospital was built in the direction East-West, has a courtyard in the centre of the building and a rectangular shaped pool. The central position takes main iwan (see Fig. 5)<sup>10</sup>. From the documents, the endowment from 1220 is preserved, stating the income for the hospital would come from taxation of more than a hundred stores and several farms. Endowment also indicates that the hospital staff includes ophthalmologists and surgeons (Cevdet, 1938, p.37-8). Although the data regarding therapy is not indicated, observing the floor plan with the main iwan across the entrance and the pool in the centre of the inner courtyard, it can be assumed that the musicians were positioned in that iwan and the patients around the pool, similar to the Divriği hospital.

<sup>8</sup> Cantay 1992, 41-4, plan 2.

<sup>9</sup> For more information see Mihaljinec 2021, 42-5.

<sup>10</sup> Cantay 1992, 45-50, plan 3.

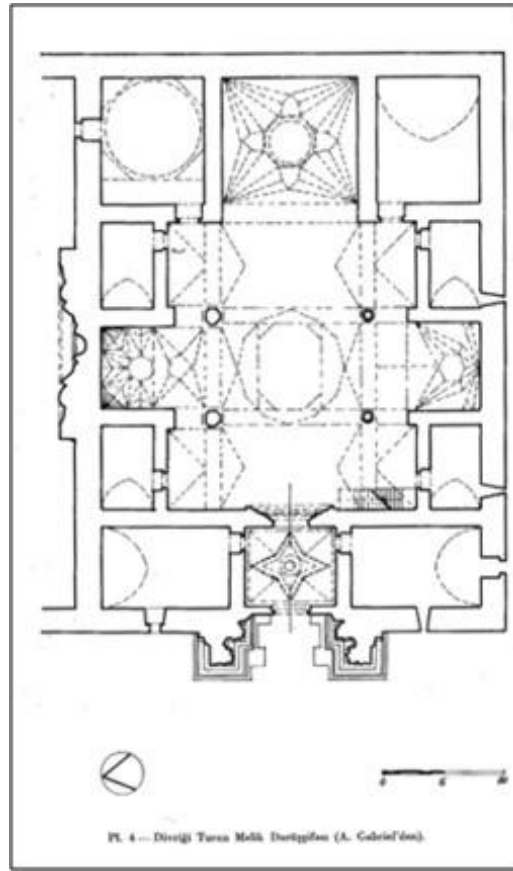


**Fig. 5.** Izeddin Keykavus Hospital, Cantay 1992, plan 3.

Turan Melike Hospital (1228-9) is part of the complex built on the leaning terrain south of the fortress in the district of Divriği. It has a set of rooms positioned on two floors (see Fig. 6)<sup>11</sup>. The central part consists of a domed courtyard and pool. The most important part of this building with two iwans is the main iwan which is on the east. The upper part of the north, south and west side of the main iwan has ornamentation in the shape of a peacock tail while the top is ornamented with a spiral which is also present in the north iwan. There is no information on how the individual rooms were used, however, it is believed that the venues on the upper floor were used by doctors and hospital employees.

<sup>11</sup> Cantay 1992, 51-5, plan 4.





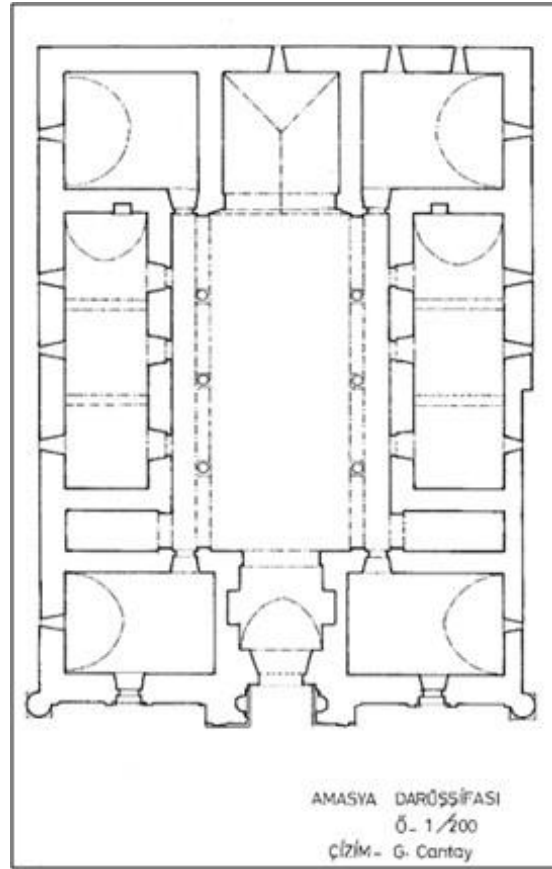
**Fig. 6.** Turan Melike Hospital, Cantay 1992, plan 4.

Anber bin Abdullah hospital (1308-1309) in Amasya was built at the very end of the existence of Anatolian Seljuk State. It was built in the direction East-West as a madrasa with an open courtyard (see Fig. 7)<sup>12</sup>. The most important part of the building is the main iwān from whose sides are rooms lined in the shape of bedrooms. It is believed that these bedrooms were used by patients as unfortunately the endowment for this building was not preserved.

According to Çoban (2005, p.51) it was the first hospital in the world where patients with mental disorders were treated with music and the sound of water. Like in today's practice, medical students were educated, and patients were treated in the hospital. In the Amasya hospital the main idea was that the sound vibration directly affects the brain cells and patients were treated with music therapy. The hospital became

<sup>12</sup> Cantay 1992, 67-71, plan 7.

the main educational and healing institution of that time. For centuries, important doctors were educated here.



**Fig. 7.** Anber bin Abdullah Hospital, Cantay 1992, plan 7.

It is also notable that the hospitals were built far from the cities in peaceful areas (Eser, 2012, p.58). Although all known examples today are in the city centres, at the time when they were built, they were situated outside of the city. The choice of the place to build a hospital was made by a method that was used in the 12<sup>th</sup> century in Syria during the reign of the Zengids. The method was to hang liver on the designated spot in the city, and the building was constructed in the place where the liver started to decompose the last. This meant clear surroundings and clean air (Eser, 2012, p.58).

These examples, which are preserved until today, and traces found next to the buildings show that the buildings were always constructed as twin buildings. One of them was used as a medical university and place where new employees would be trained, while the other was composed of the rooms in which patients

would be examined and, in cases when it was needed, hospitalized and treated (Mihaljinec & Eser, 2022, p.68).

In addition to being built outside the residential area and as twin buildings, the architecture of the Anatolian Seljuks has no other specificities regarding the construction of the hospitals (Eser, 2012, p.58). The edifices are built according to the plans and shape of educational "institutions". Most probably many hospitals had a dormitory for patients, as can be seen in the example of the Anber bin Abdullah Darüşşifa in Amasya (Cantay, 2014, p.69).

The madrasa plans show the common characteristic that is a position of the iwans and the courtyard, but only closed courtyard within the hospital is in the Melike Turan's Divriği hospital.

As a best-preserved example, Divriği hospital was used to conduct the acoustic analysis and to make some conclusions regarding music therapy and the architectural style used for the venue. It is the only example from the Anatolian Seljuk period of a dual mosque-hospital complex and with the closed courtyard. The interior is spacious and there is no visual and auditory obstruction. It is a design consisting of multiple parts such as iwans, arcades, rooms and stairs leading from the ground floor to the first floor. On the south and north side there are also iwans, while the main entrance door is on the north. In the center position is the pool which was filled with water in the Seljuk time. The gallery, on which spaces and rooms are situated, due to the size of the windows was not significant in the calculation of the acoustics. The position of the stairs situated at the back door was also not significant in terms of acoustic calculations. The lateral surfaces of the hospital were made from limestone and its coefficient was used for the calculations. All the ornamentation inside is engraved in limestone, only the dome has some wooden construction elements, which was not significant for the acoustic parameter, as the original building did not have the roof coverage. The calculation was based on the original plan (Mihaljinec, 2021, p.165).

First the music analysis was made on 8 different makams (see Fig. 8), samples were taken based on the works of scholars from 8<sup>th</sup> and 9<sup>th</sup> century such as al-Farabi and Ibn Sina who were writing about therapeutic qualities of makam music. The result of the analysis were common frequencies in all makams (see Fig. 9).

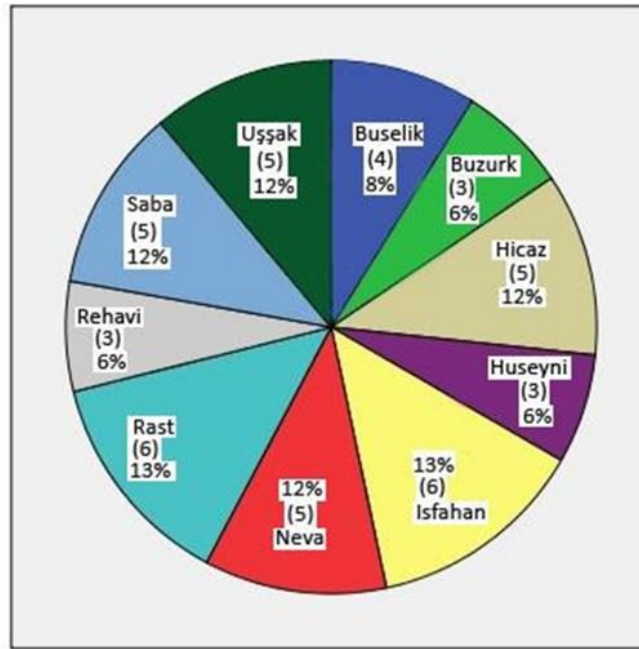


Fig. 8. Distribution of the 45 makams used for analysis, Illustration by I. Mihaljinec

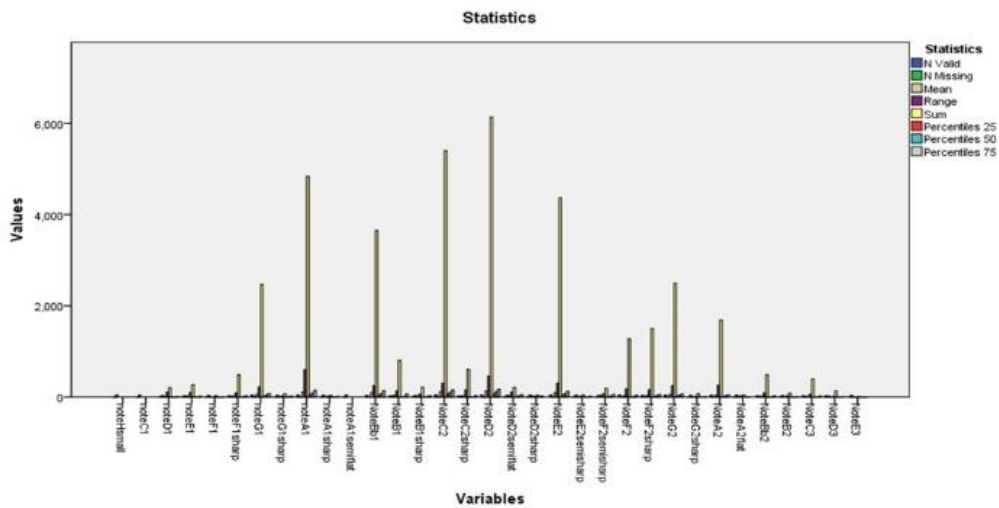


Fig. 9. Descriptive statistical analysis, illustration by I. Mihaljinec

These results were followed with the acoustic analysis by creating a 3D model of the hospital. The parameters of dimensions and material were taken into consideration for the test (see Table 1 and Fig. 10).

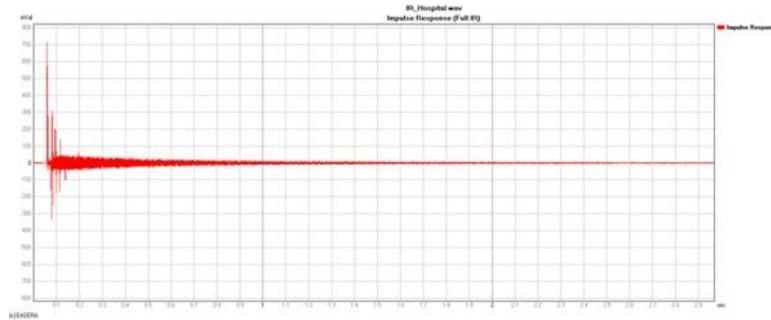
**Table 1** Surface area of Divriği Hospital in meters

Surface in meters			
S stone /limestone	958.84 m <sup>2</sup>	Width	15.00 m
S openings (doors and windows)	20 m <sup>2</sup>	Length	13.60 m
S water	5.40 m <sup>2</sup>	Volume (mean)	1965 m <sup>3</sup>

**Fig. 10.** 3D model of Divriği Hospital, illustration by I. Mihaljinec

In the model, the microphones were positioned in 2 places and the impulse in the form of a gunshot was performed. The impulse response time was 2,9 seconds (Fig. 11) and echogram (Fig. 12) show the fast decay of the echo which means it is not distorting the sound. Also, the results have shown reverberation time (Table 2) and clarity measure (Table 3) that are two major perceptions which define the quality of the acoustic space<sup>13</sup>.

<sup>13</sup> For more information see Mihaljinec, 2021; Mihaljinec and Eser, 2022.



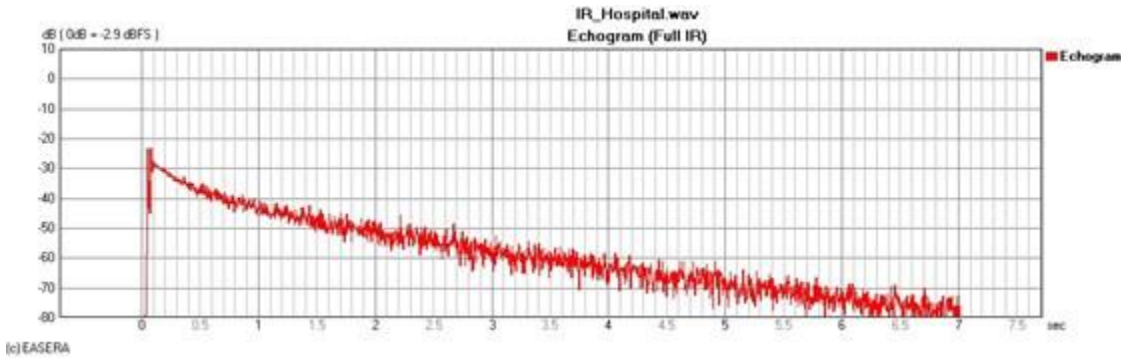
**Fig. 11.** Impulse response in Divriği hospital

**Table 2** Reverberation time in Divriği Hospital

	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
	s	s	s	s	s	s	s
EDT	12.18	10.63	7.68	5.39	3.76	2.69	1.53
T10	12.03	10.56	8.13	5.39	3.98	2.68	1.51
T20	11.44	10.81	8.06	5.61	4.15	2.93	1.76
T30	11.19	10.74	8.57	5.94	4.32	3.08	2.10

**Table 3** Clarity measures in Divriği Hospital

	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
	dB	dB	dB	dB	dB	dB	dB
C7	-27.8	-24.7	-16.3	-14.5	-12.4	-10.6	-7.4
C50	-13.1	-13.1	-10.6	-9.1	-7	-5.6	-2.7
C80	-11.5	-10.3	-8.1	-7.1	-5.3	-3.3	0.3
C split	-13.8	-14.4	-11.1	-10.6	-8.7	-7.1	-4.6



**Fig. 12.** Echogram in Divriği Hospital

The gained results showed that as the frequency grows, the response time shortens, and the results of the reverberation time and clarity measure are as in any modern concert hall.

## Conclusion

The architectural characteristics of Divriği Hospital fulfil the acoustic standards for the good reception of the sound for the audience and support the hypothesis of being suitable for the healing purposes. Also, the architectural structure of the complex and sound events in that venue support the healing effect. The acoustic analysis has shown that the sound realization could take place in the hospitals which were designated to support it, and to support the environmental soundscape in conjunction with the sounding makams. Therefore, it can be assumed that the effect of the environmental soundscape and the sound realization is similar in the examples of Gevher Nesibe, Izzeddin Keykavus and Anber bin Abdullah hospitals, according to their plans and function.

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