EXPLORING THE "LEISHESHAN" AND "HUOSHENSHAN" TEMPORARY HOSPITAL BUILDING (CONSTRUCTED DURING COVID-19, CHINA), MODEL: LESSONS, APPLICABILITY AND BARRIERS FOR ENGINEERING PROFESSIONALS IN BANGLADESH

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ABSTRACT

Bangladesh is a small Asian country that has enriched itself in a very short time since its independence. It has focused on various sectors to drive economic growth, improve infrastructure, enhance social development, reduce poverty, strongly emphasizing education and skill development. In late 2019 and in 2020, when the entire world is engulfed in the outbreak of the coronavirus, this small country has also fought the pandemic as best as it can. Where the COVID-19 first outbreak in China, the government of China acted quickly and built specialized temporary hospitals named as "Leishenshan Hospital" and " Huoshenshan Hospital" within 10-15 days to offer medical care for COVID-19 patients, which resonates worldwide. The findings and conclusions presented in this paper are derived from an extensive synthesis of information obtained from an array of academic research articles, reputable review papers, credible online sources, reputable newspapers, and other relevant scholarly publications. This paper presents lessons learned from the construction of Chinese specialized hospitals during the pandemic such as the rapid construction timeline, sustained material used, modular design, and effective utilization of resources, which are analyzed for their potential applicability in Bangladesh. The paper also discusses potential obstacles that Bangladeshi engineers might encounter when implementing the temporary Hospital concept. The topic involves the obstacles and how to get over obstacles including scarce resources, bureaucratic difficulties, and cultural differences. The main objective of this paper is that in case of future pandemic situations like COVID-19, quick steps can be taken to provide proper patient care and urgent medical facilities in Bangladesh. The conducted feasibility study reveals that the implementation of this hospital model is possible in Bangladesh. Though this is economically unpleasant for the country. The paper also addresses how crucial it is for engineers, policymakers, and healthcare professionals to work together to successfully adopt the Leishenshan Hospital model. It emphasizes the necessity of interdisciplinary approaches and the fusion of engineering and medical knowledge. In conclusion, engineers in Bangladesh can benefit much from the analysis of the Hospital model. Bangladesh has to improve its preparedness and reaction to future pandemic emergencies by incorporating the lessons learned and removing any obstacles, assuring the effective building and operation of healthcare facilities.

Keywords: *Covid-19, Infrastructure, Obstacle, Adopt, Benefit*

1. INTRODUCTION

COVID-19 has had a devastating impact on global health and economies worldwide. The COVID-19 pandemic has caused immense suffering and loss of life(Cai et al., 2021). According to the last update: November 06, 2023, as of right now, 229 nations and territories have 697,390,307 confirmed death cases. We're still evaluating the death rate ("Coronavirus Deaths Graphs," n.d.; "WHO COVID-19," n.d.). In Wuhan, China, a case of COVID-19 was first reported in December of 2019. Since then, the illness has spread quickly around the world, prompting the proclamation of a pandemic ("COVID-19 - Wikipedia," n.d.). Each year, the world experiences a range of new and diverse disasters that pose significant threats and require effective response and mitigation measures. China's construction of a specialized hospital for COVID-19 was unprecedented and remarkable, demonstrating its commitment to effectively managing the crisis. The rapid establishment of such a facility showcased China's dedication to providing specialized care and containment measures during the pandemic (Chen et al., 2020; Zhou et al., 2020). They use prefabricated materials, steel structure box-type modular houses, sterile wallboards, steel frame structure systems, and container-type pre-fabricated houses (Peng, 2021; Zhou et al., 2020). BIM (Building information modelling) +IBS (Industrialized Building System)-related technologies were extensively utilized during the hospital building construction, contributing to the effective monitoring and control of the construction process. The application of BIM modelling in China's construction industry has revolutionized the process, allowing for the rapid completion of a hospital building within a remarkable timeframe of 10-15 days (Wang et al., 2022). Meanwhile, with each passing day, Bangladesh is making remarkable strides in its development, positioning itself as a thriving nation. During the COVID-19 pandemic, Bangladesh implemented several measures to mitigate the impact and ensure public safety with limited resources (Islam et al., 2020). Bangladesh can benefit from studying China's methods and approaches in addressing pandemics and contagious situations as a means to enhance its preparedness for future outbreaks. China's strategies and practices in managing pandemics present valuable learning opportunities for Bangladesh to strengthen its response capabilities and mitigate future risks.

2. METHODOLOGY

This retrospective observational study analysed the utilization of health resources in two typical cases of modular construction of Leishenshan Hospital and Huoshenshan Hospital in Wuhan, China, and they were for patients with clinically mild-to-moderate symptoms of COVID-19 infection (He et al., 2021; Wang et al., 2020; Zhang et al., 2021). The location, technology, design, structures, materials utilized during construction and project management of the selected hospitals were all analysed. To determine the need for modular construction method in Bangladesh and its appropriateness for a spectrum of purposes in a range of contexts, the successful cases were presented from the perspectives of the project's goals, locations, project design, construction materials, and structures, employed construction technologies and construction periods. All this information collection was accomplished by gathering and maintaining data with care. All this data were collected from several reputable research papers, articles, thesis papers, and websites. Since all chosen instances have been published in reputable engineering publications, the validity of the current study is increased and the reliability of data collection is guaranteed. Precise data analysis was done with the Bangladesh construction method and also strengthen the validity of the findings and results by contrasting and comparing the gathered data.

3. HEALTH CARE FACILITIES DURING COVID-19 IN CHINA

The epicentre of the COVID-19 pandemic was Wuhan, the capital city of Hubei province in China, more than 60% of all COVID-19 cases in China as of March 27, 2020, were confirmed cases in Wuhan (Chen et al., 2020). Wuhan offers three different ways to admit people for treatment: Fangcang Shelter Hospitals, newly constructed temporary hospitals, and designated hospitals (Li et al. 2021). These temporary hospitals were established to provide immediate medical care and isolation facilities for COVID-19 patients, helping to alleviate the strain on existing healthcare infrastructure (Li et al. 2021).

Temporary Hospital Huoshenshan and Leishenshan

Wuhan City, Hubei Province, was the hardest-hit area due to the spread of the new crown pneumonia epidemic (Peng, 2021). Next to the Wuhan Staff Sanatorium near Zhiyin Lake, a medical point with a bed capacity of approximately 1,000 will be built (Chen et al., 2021; Peng, 2021; Zhou et al., 2020). The building site will occupy approximately 34,000 square meters (Peng, 2021; Zhou et al., 2020). To construct Huoshenshan Hospital, the Bureau of Housing and Urban-Rural Development of Wuhan called a special meeting of the China Construction Third Engineering Bureau Co. Ltd. on January 23, 2020 (M. Zhou et al., 2020). On February 2, 2020 hospital was formally opened shown in Fig. 1(left) (Peng, 2021; Zhou et al., 2020).

The Wuhan government decided in the afternoon of January 25 to construct the Leishenshan Hospital south of the Yangtze River in less than two weeks (Wen-tao & Song-min, 2020). Situated in Jiangxia District's Wuhan Military Games Athletes' Village, Leishenshan Hospital occupies an abandoned parking lot with a site area of over 220,000 m2 and a total construction area of nearly 80,000 m^2 shown in Fig. 1(right) (Chen et al., 2021; Wen-tao et al., 2020).

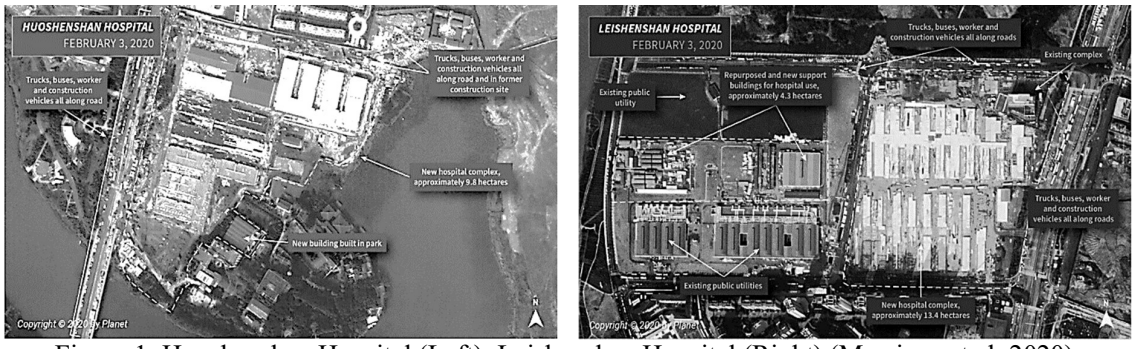

Figure 1: Huoshenshan Hospital (Left); Leishenshan Hospital (Right) (Morrison et al. 2020).

This kind of facility can only be built in three to five years, normally at least 2 years (Chen et al., 2021; China Builds Hospital in 10, n.d.). More than 1500 pieces of machinery and equipment were built for more than 10,000 workers during the building's busiest development period (L. K. Chen et al., 2021). 1,491 pieces of excavators, cranes, and other machinery and equipment, 7,906 construction workers, and 1,025 building supervisors are employed in the construction industry (Chen et al., 2021). It took 12 days to construct, and between February 8 and April 14, 2020, it ran for 67 days (Cai et al., 2021; L. K. Chen et al., 2021). March 19 was the most recent admission, and on April 14, 2020, the hospital closed following the last patient's release (Chen et al., 2021). Nineteen medical teams, comprising 2312 nurses and 933 doctors, were progressively relocated to Leishenshan Hospital from all around China throughout the hospital's 67-day operation. There were 1396 hospital beds at Leishenshan Hospital, including 59 ICU beds (Cai et al., 2021). Huoshenshan Hospital admitted 3059 patients during their service tenure, while Leishenshan Hospital admitted 2011 patients (Li et al., 2021)

4. A GENERAL PLAN OUTLINE FOR CONSTRUCTING TEMPORARY HOSPITAL

Technology Used

The Huoshenshan and Leishenshan Hospitals were built virtually using an approach that combines BIM technology with constructed buildings (Hong, 2022; C. Wang et al., 2022; M. Zhou et al., 2020). At the beginning, the design team used Revit software to produce a comprehensive 3D model of the building structure. as shown in Fig. 2 (Hong, 2022; Wang et al., 2022; Zhou et al., 2020).

Three stages make up the BIM modeling process: structural modeling, architectural modeling, and Navisworks 4D construction scheduling navigating with Navisworks (Wang et al., 2022). The architects created the combined modules by utilizing the modular features of YJK-AMCS (Zhou et al., 2020). The hospital used Architectural models underpinning BIM 5D and BIM 4D results, helping to manage material requirements, capacity, project delivery schedules, pipe layout, energy consumption analysis,

and projection of natural light (Hong, 2022; Zhou et al., 2020). The IBS method of modularizing mobile homes into container panels has replaced the old construction model, allowing intuitive control and parameterized design during the construction process through BIM+IBS (Hong, 2022).

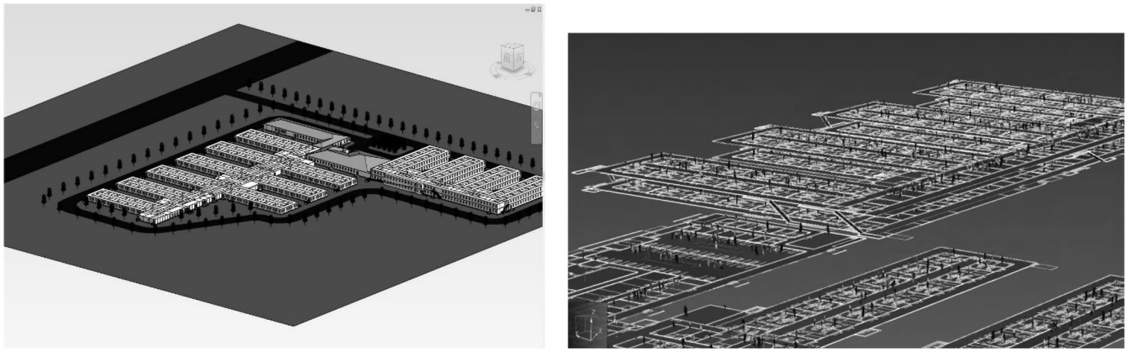

Figure 2: Model simplified rendering(left) ; Agent-based simulation using BIM model built in Revit (Right) (Wang et al., 2022).

The majority of the BIM components reached a level of development (LoD) of LOD350 (Luo, Liu, Li, Chen, & Zhang, 2020). When prefabricated components are brought to the construction site during the construction phase, the quality monitoring department can use RFID tags to scan the pertinent information (Hong, 2022).

The Pathfinder finite element meshing method was utilized to conduct an empirical study during the construction of Wuhan Huoshenshan Hospital. To do this, a crowd grid model was added. The motion path was solved using the integrated solver. The primary interfaces utilized were MS Excel, Revit 2017, Navisworks 2017, Revit Zuku Master, and Modelling Master. The Pathfinder software was utilized to develop an evacuation plan for individuals in case of an emergency, based on the Dxf model (Wang et al., 2022). Main contractor worked with the designer to model the structural steel in TEKLA, a BIM software from Trimble Co (Luo et al., 2020).

Utilization of Design and Layout

The temporary hospital project used prefabricated container-style movable board housing in its design and construction (Chen et al., 2022; Hong, 2022; Wen-tao et al., 2020). The three main modules of Leishenshan Hospital (Vulcan Mountain) and Huoshenshan Hospital (Thunder Mountain) are the isolation medical area, the living space for medical staff, and the support area shown in Fig. 3 (Chen, 2023; Chen et al., 2022; Wen-tao et al., 2020).

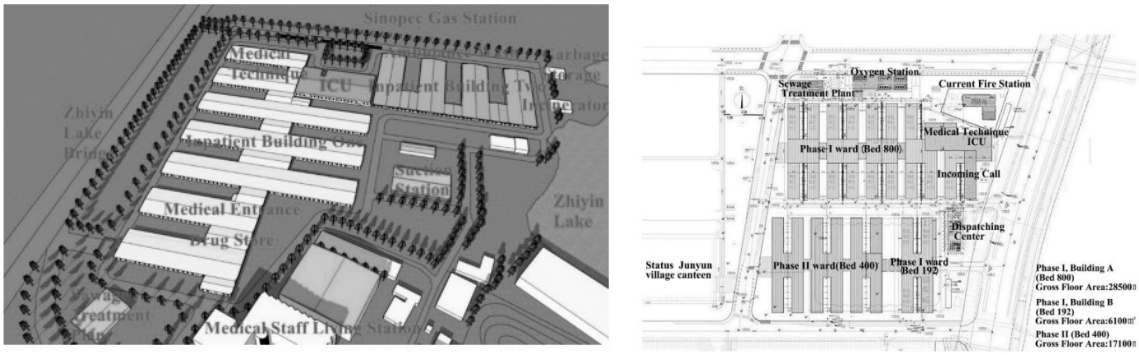

Figure 3: Functional module partition of Hoshenshan Hospital (left) (Chen et al., 2022) ; Leishenshan Hospital (Right) (Chen et al., 2021).

4.1.1 Architectural Design

Leishenshan Hospital used a "Three Zones and Two Channels" structure, with clean, semi-contaminated, and contaminated sections as well as the patient channel and the medical treatment (Chen, 2023; Smolova et al., 2021; Wang et al., 2022; Wen-taoet al., 2020). The medical technology portion of both hospitals has a "Fishbone" layout with a steel frame and lightweight wall panels shown in Fig. 4. The fishbone layout's isolated medical area is split into the north and south halves based on the topography in the Leishenshan hospital area (Chen et al., 2022; Wen-taoet al., 2020). In both hospitals building, every ward module has 50 beds available (Wang et al., 2022; Wen-tao et al., 2020). There are two critical care units and 30 isolation wards in the isolation medical sector (Chen et al., 2022).

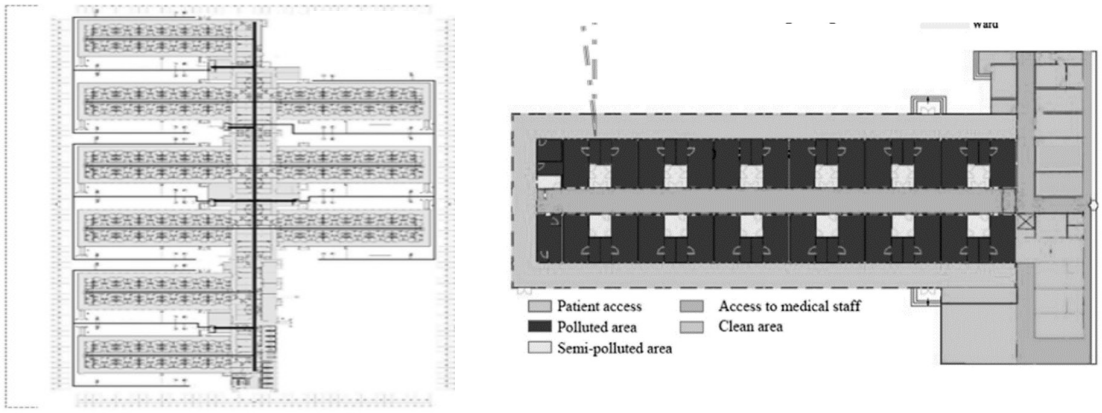

Figure 4: Schematic illustration of the H-module isolation medical area(left) ; Diagram of floor layout analysis (Right) (Chen et al., 2022)

4.1.2 Structural Layout

In both hospitals, the project's design and construction processes were considerably streamlined and time was saved by arranging the rooms with repetitive functions in a symmetrical and matrix manner (Wang et al., 2022; Wen-tao et al., 2020). The ward area in Huoshenshan used modulus sized 3 m × 3 m. The corridor's smallest unit measured 3 m × 3 m, while the ward's smallest unit measured 3 m × 6 m (Chen et al., 2022; Wang et al., 2022). In both Hospitals, two box-type room units measuring 2 × 6 × 2.9 m and 3 × 6 × 2.9 m were utilized in Fig. 5 (Chen, 2023; Chen et al., 2022; Chen et al., 2021). Each ward has two beds, and a separate toilet gives doctors and nursing staff multiple security measures in a productive and safe environment. The height of the module unit is 2900 mm (Chen et al., 2022). The steel columns are "L" shaped and inclined, rising to a height of 3 meters. Bolts are used to join the hooks and prefabricated plates (Chen et al., 2022). The basic module of 1.8 m x 1.8 m was chosen due to the medical technology area's more sophisticated functions and larger requirements for flexible space (Wang et al., 2022).

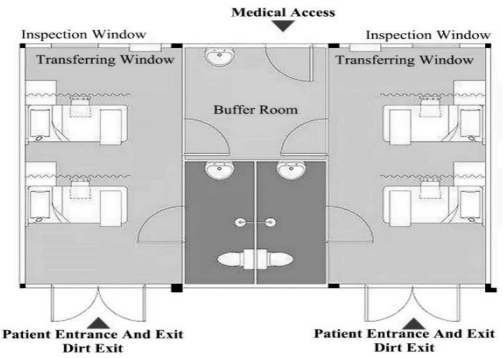

Figure 5: Nursing unit staff flow chart (Chen et al., 2022).

Components and Building Techniques

More people in China are becoming aware of the potential of prefabricated buildings as a result of the development of hospitals in Huoshenshan and Leishenshan (Chen et al., 2021). Leishenshan Hospital consists of a modular design, steel structure box type modular house, sterile wallboard, prefabricated steel frame structure system, and container type pre-fabricated house (Chen et al., 2021; Zhou et al., 2020).

4.1.3 Foundation Stage

Huoshenshan Hospital is situated on a hilly lake plain to the west of Wuhan City (Peng, 2021). Because of the geological circumstances and the comparatively stable and hard subsurface rock layer, there was an increased demand for quick construction (Chen, 2023; Peng, 2021). For the upper floor to meet structural requirements, the base was higher than the ground. The bottom plate was blocked with masonry, and the box's bottom was cushioned with square steel to help it become water tight and moisture-proof in Fig. 6 (Chen, 2023). In Leishenshan, the first parking lot or green belt region is where the isolation area was situated. The original parking lot area had a concrete floor (Chen et al., 2021). Next, install a built-in single layer, a 200 mm thick C30 concrete hardening layer, and two-way 12 @ 200 reinforcing mesh in situ (in Fig. 6) (Chen, 2023; Chen et al., 2021).

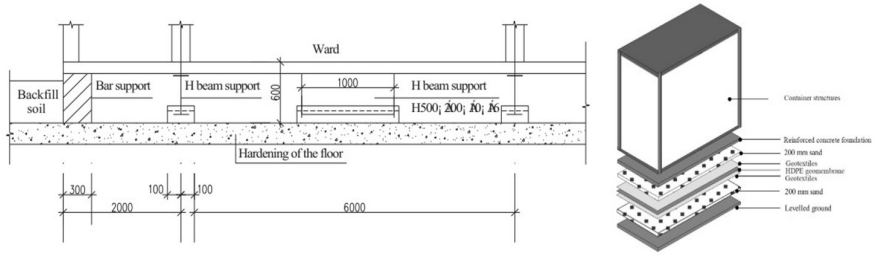

Figure 6: Foundation layout of a typical area of the ward nursing unit in Leishenshan Hospital (Chen et al., 2021) (left) & Typical structural build-up displaying the foundations' HDPE anti-seepage layer (Zhou et al., 2020) (right)

4.1.4 Standardized Production Stage

At Leishenshan Hospital, over 95% of the building materials are factory-prefabricated. These include the steel structure components (fig 7), finished restrooms and shower rooms, inner wall partitions in the test and imaging area, sterile wallboard for operating rooms and clinical labs, and all bathroom products and E&M facilities. Standard prefabricated parts are recyclable and environmentally friendly as they may be disassembled, reconstructed, and recycled (Wen-tao et al., 2020).

Figure 7: It only took 40 hours for a steel structure manufacturer from Anhui Province to load and deliver 2,000 sets of standard steel structural components to the Leishenshan Hospital location (Wen-tao et al., 2020).

4.1.5 Prefabricated Construction Stage

The Leishenshan Hospital construction project was completed in just 12 days, from January 26, 2020, to February 6, 2020 (L. K. Chen et al., 2021; Smolova & Smolova, 2021). The steps of the particular construction process are roughly broken down as follows: a)Site preparation, b)Pipe trench excavation, c)Local backfilling, d)Site hardening floor construction in Fig 8 (left), e)HDPE membrane construction, f)Strip and shaped steel buttress, g)Raft foundation construction, h)Box house installation in Fig 8(right), i)Steel structure installation in Fig. 9, j)Wall partition and roof installation, k)Pipeline installation and decoration, l)And therapeutic equipment and furniture installation and commissioning (Chen et al., 2021; Smolova et al. 2021).

Figure 8: Two days following work, reinforced concrete ground floor slabs were cast in Hoshenshan Hospital (Zhou et al., 2020) (Left); Field Assembly of a Modular Home with a Steel Structure Box Type ("China Builds New Hospital in 10 Days " n.d.) (Right)

The project uses the prefabricated moveable board home method, which will result in prefabrication, transportation, installation, and other labour, to increase the efficiency of construction (Chen et al., 2021; Peng, 2021). The proposal combines three different prefabricated construction techniques for different purposes within the building. In the Inpatient Department, advanced steel construction box-style modular homes (prefabricated container homes) are used for each room. In the Department of Testing and Imaging, a steel-frame structure system is utilized. For the Medical Staff's Living Area, a two-story light-steel prefabricated home system is used, which is separate from the ward area due to space and plane constraints (Zhou et al., 2020).

Figure 9: Wielding of steel structure (left) ("China Builds New Hospital in 10 Days," n.d.) On-site, container components are being fastened together in Huoshehsan hospital (right) (Zhou et al., 2020)

5. BANGLADESH DURING COVID-19

COVID-19 was first identified in Bangladesh on March 8, 2020. Till now, the number of COVID-19 cases was 20,45,892 with the death of 29477 persons (Islam et al. 2020).
Since the COVID-19 epidemic, healthcare facilities in Bangladesh have faced enormous challenges in providing patient treatment. Bangladesh had 141,903 hospital beds, or 0.84 beds per 1000 people,

according to ("The Daily Dhaka Tribune", March 21, 2020) (Hasinur et al. 2020; Anjum et al. 2022). A 100-bed hospital should have at least five ICUs, according to international standards. In reality, hospitals in Bangladesh have fewer than 1200 ICU beds (432 government, 737 private) in total (Hasinur et al., 2020; Mohiuddin, 2020). According to reports, there were 1,769 ventilators in Bangladesh at the beginning of COVID-19, implying one ventilator for every 93,273 people (Mohiuddin, 2020). Finally, the Government of Bangladesh established the National Preparedness and Response Plan (NPRP) on March 18, 2020. with a budget of USD 29,550,000 million for COVID-19 (Anjum et al., 2022). The GoB expanded the number of intensive care units, hired and trained 5,000 nurses and 2000 doctors, and provided safety precautions for medical staff. The "Chinese lockdown strategy," according to decision-makers, will not be entirely applicable in Bangladesh due to the country's low socioeconomic conditions for individuals and other variables (like the capacity of the government, the support infrastructure, medical facilities, and technology) (Mohiuddin, 2020). Following this, the Health Minister of Bangladesh suggested on April 9, 2020, that ICCB (International Convention City Basundhara) house a 2,000-bed Isolation Centre. However, 1,300 beds at the DNCC (Dhaka North City Corporation) Market and 1,200 at Uttara Diabari were prepared to serve. Apart from these, 601 additional institutions in districts and Upazilas—including the nation's capital—were remodelled as isolation hubs for coronavirus (Anjum et al., 2022).

6. LEISHENSHAN HOSPITAL STRATEGY IN BANGLADESH

For temporary hospitals, CSCEC (China State Construction Engineering Corporation) developed an integrated technical standard that covers every aspect of the facility—from design to manufacturing to operation (China.org.cn, 2020). Akij Group and Gonoshasthaya Kendra of Bangladesh had intended to construct a similar type of hospital through a joint venture, motivated by China's success in treating coronavirus-infected patients by constructing temporary hospitals. The hospital is planned to be constructed on the industrial group's vacant plot in Tejgaon, close to the TVS motorcycle factory (Dhaka Tribune, 2020). Fearing infection, residents of Tejgaon, Dhaka, vandalized the hospital's construction site. Because the area is populated by densely packed slums, establishing a hospital there would put its citizens at risk of contracting the coronavirus (bdnews24, 2020). For this, the construction of a temporary hospital by the Akij group was cancelled (Dhaka Tribune, 2020).

Figure 10: DNCC Dedicated Covid-19 hospital, Mohakhali (Left) (dncc-dch.gov.bd); ICCB 2000 beds COVID-19 Hospital (Right)

After that, The Health Minister announced a decision to establish a hospital on April 9, 2020, in the open area of the International Convention Centre Bashundhara (ICCB) in Fig. 10(right) (DNCC, n.d.). The hospital was officially opened on 17 May 2020 by the minister of health. During the initial months of the COVID-19 outbreak in the nation, it was established as an isolation centre, complete with 2,031 general beds, 71 ICU beds, and 10 ventilators. Alliant Group, a third-party organization, constructed the hospital's structure while working under the supervision of the health ministry (Banglanews24, 2020; The Daily Star, 2021). The government supplied the medication, physicians, nurses, and other support personnel. It was believed to be the second-biggest Covid-19-specific hospital worldwide. However, on September 30, 2020, the health ministry closed the temporary hospital "due to lack of patients". The much-discussed temporary 2,000-bed Bashundhara Covid-19 hospital is being held up

as an illustration of the health department's poor Covid-19 management planning (The Daily Star, 2021). More healthcare facilities were desperately needed because COVID-19 had claimed many lives in the nation. The prime minister, Sheikh Hasina, decided to turn the Dhaka North City Corporation's (DNCC) kitchen market in Mohakhali which was prepared for business, into a hospital for the care of Covid-19 patients in Fig. 10(left). At 1,000 beds, it is currently the biggest COVID-19 hospital in Bangladesh for treating patients infected with the coronavirus. Out of the 1,000 beds, 288 are HDUs and 212 have been set up as ICUs. There are 500 general beds with oxygen support (Dhaka Tribune, 2021; DNCC, n.d.; The Daily Star, 2020). Together with the most advanced technology and highly skilled professionals, the hospital also offers the most recent Pathology Lab, Radiology Imaging, RT PCR, and many other COVID-19-related tests (DNCC, n.d.). 18 April 2021 was scheduled for the opening of the DNCC specialized hospital and isolation centre (The Daily Star, 2020). The relevant authorities were required to make sure that the DNCC hospital does not suffer from the same fate as the ICCB temporary hospital and that it operates effectively, having an adequate supply of personnel and medical equipment. This hospital has a large number of medical professionals and administrative staff assigned for continuous service, including 130 doctors, 200 nurses, 300 other staff members, and 96 army personnel (DNCC, n.d.; The Daily Star, 2020). After demolishing the existing shops, wards, cabins with attached restrooms and showers, and the necessary medical equipment were installed. It was mentioned that once things settle down again, the COVID-19 hospital at the DNCC market will turn into a general hospital and nursing institute. The hospital is currently run by the armed forces (Dhaka Tribune, 2021).

7. BARRIERS TO CONSTRUCTION: TEMPORARY HOSPITALS OF CHINA IN BANGLADESH

Over 95% of the building materials at Leishenshan and Huoshenhen Hospital are prefabricated in a factory. All of these structural materials are transported to the site from the factory for assembly and hoisted on-site (Wen-tao et al. 2020).

Prefabricated construction is one of those time and money-saving techniques that also reduces waste generated during construction on the job site and offers longer-lasting durability (Chowdhury, 2022; Datta et al. 2022; Paudel et al. 2016). Bangladesh can also utilize this system. However, it is a fact that this method's concept and knowledge are not widely accepted in this place. During the COVID-19 situation, Bangladesh didn't adopt any prefabricated strategy like Leishenshan & Huoshenhen Hospital in any of its temporary COVID-19 special hospitals. Bangladesh adopted all the old conventional building construction techniques in all the COVID-19 special hospitals. Again, most of the building that were used as COVID-19 hospital during the coronavirus pandemic was already constructed by conventional strategy. Conventional building construction has a lot of drawbacks, including excessive costs, long construction times, labour shortages, worker safety issues, and more (Chowdhury, 2022). The top three obstacles to prefabrication construction in Bangladesh are "High initial cost," "Inadequate local R&D institutes and services," and "Lack of skilled contractors on prefabrication" (Datta et al. 2022). There were also delays in delivering the promised dedicated COVID-19 hospitals according to opening dates in Bangladesh. "Delay in progress payments," "Rework due to mistakes during construction," "Lack of skilled labore," "Poor monitoring and control of activities," and "Delays in the making of a decision" are the top five factors that influence delays in the rapid construction of Bangladesh (Hoque et al. 2023).

8. CONCLUSION

China's remarkable response to the coronavirus crisis included the extraordinary accomplishment of constructing temporary hospitals, such as Leishenshan and Hoshenshan, in less than 15 days, setting a new benchmark for speed and efficiency. The temporary hospital models were built using BIM+IBS technology, with modular design, steel structures, sterile wallboards, and prefabricated containers.]. Bangladesh has been slow to adopt prefabrication techniques and faces challenges in embracing innovative building practices. The reliance on conventional construction methods has impeded progress, contributing to project delays and a lack of implementation of rapid construction techniques in

Bangladesh. Following the example of the Chinese rapid construction techniques, minimizing "change orders during construction," making decisions as soon as possible to prevent project delays, and making "progress payments" to contractors on time to finance the work might be a solution for future rapid construction delays in Bangladesh. The implementation of prefabrication techniques in Bangladesh would enable the construction of rapid buildings inspired by Hoshenshan and Leisheshan, offering a timely and cost-efficient solution in the future for any kind of sudden calamities or at disaster time.

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