

2023

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### Recommended Citation

Gulzar, Adnan; Javed, Anosh; Liaquat, Amna; Javed, Daniyal; Zahid, Maham; and Mumtaz, Hassan (2023) "Lifestyle and dietary habits change before and during quarantine and subsequent weight gain," *Journal of Community Hospital Internal Medicine Perspectives*: Vol. 13: Iss. 3, Article 5.

DOI: 10.55729/2000-9666.1176

Available at: <https://scholarlycommons.gbmc.org/jchimp/vol13/iss3/5>

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# Lifestyle and dietary habits change before and during quarantine and subsequent weight gain

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# Lifestyle and Dietary Habits Change Before and During Quarantine and Subsequent Weight Gain

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## Abstract

**Background:** Pandemics greatly affected human health due to changes in dietary habits and lifestyle

**Methods:** A multi-centric comparative cross-sectional study was conducted online using a structured questionnaire with 323 respondents from two medical colleges of Lahore, Pakistan. The collected data was analyzed including various variables of dietary habits, lifestyle changes and were compared by using paired sample t-test. Chi-square test was applied to measure the relation of weight gain with lifestyle and dietary habits changes.

**Result:** Out of 323 participants, 64.5% of them observed an increase in their weights and 64.1% of respondents noticed an increase in caloric intake. An increase in chicken, milk, oil, sugar and legumes intake was increased significantly during the quarantine. The lifestyle changes were noted in 91.6% of participants and decreased physical activity, working duration and outdoor games were found significant. Out of 7.4% of students who were smokers, 6.8% of them quit smoking during the quarantine.

**Conclusion:** A significant increase in weight is indicated during quarantine as compared to before quarantine probably due to the changes in dietary habits and lifestyle. If the pandemic prolongs, the problem of weight gain may worsen and lead to obesity and other health problems.

**Keywords:** Weight gain, COVID-19, Quarantine, Lifestyle changes, Dietary habits

## 1. Introduction

These days, the world is encountering a pandemic situation due to Coronavirus. The COVID-19 disease is also called severe acute respiratory syndrome 2 (SARS-CoV-2). In December 2019; it was considered that (SARS-CoV-2) spread from the seafood market of Wuhan, city of China, to the rest of the globe.<sup>1</sup> On 30th January 2020, the World Health Organization Emergency Committee declared a global health emergency because the cases were increasing rapidly.<sup>2</sup> Due to the increasing burden on the hospitals, as there was no specific treatment to overcome the disease, different countries decided to go for a strict lockdown to stave

off this novel disease from spreading. In Pakistan, the first case of COVID-19 was confirmed by the Health Ministry of Pakistan on 26th February 2020 in Karachi, city of Sindh Province.<sup>3</sup> On 6th April 2020, the Health Ministry of Pakistan reported a total of 3277 confirmed cases in the country with 18 in critical condition. Out of 3277, the highest cases were reported in province Punjab (1493).<sup>4</sup> The first highest peak of coronavirus in Pakistan is reported in mid of June 2020 with 6825 confirmed cases in a single day.<sup>5</sup> On 29 August 2020, the recovery rate in Pakistan stands at 94.9% with a total 295,372 confirmed positive cases out of which 280,340 were recovered.<sup>6</sup>

The lockdown and social distancing have disrupted the normal lifestyle and dietary habits of the

Received 10 October 2022; revised 5 February 2023; accepted 15 February 2023.  
Available online 8 May 2023

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<https://doi.org/10.55729/2000-9666.1176>

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medical students just as it has the rest of people because they become dependent only on digital education and smart working. To reduce the risk of spreading the virus and to protect the students, they were pulled from the hospitals, classrooms and hostels. As the medical education programmer has two phases, an initial preclinical phase (1st year and 2nd year) and subsequent clinical phase (3rd year to 5th year), When the crisis became tense the volunteer but due to risk of spreading disease among the students and others, this decision remained pending. Just like other people they were also restricted to their homes. Only limited to homes and continuous hearing about Covid-19 is stressful and, in such condition, it is crucial to maintain a healthy lifestyle and dietary habits to support body immunity. Because of limited access to daily fresh fruits and vegetable shopping, people start using junk foods, snacks, and artificial cereals most of the time. All these substances contain high calories, more sugar, more fat and fewer fibers. The daily updates about Covid-19 are stressful. Previous studies suggest that stressful conditions lead a person towards overeating, especially a sugar-rich and high-fat diet; this type of overeating is called emotional eating. The relationship between stress and overeating is well understood.<sup>7</sup> The literature review has suggested that emotional eating is also associated with higher weight.<sup>8</sup>

COVID-19 also negatively changed the normal lifestyle of the people. Outdoor games become restricted and gym centers are closed. Lifestyle changes mostly include disturbance of sleep, sports, and other physical activities.

Only staying at home considerably limits physical activity which can lead to the emotional imbalance, especially in older ones, social isolation could lead to anxiety, depression, mental disturbance, disability and a higher risk of cardiovascular diseases.<sup>9</sup> Due to less physical activity, normal regulation of body fat is greatly affected.<sup>10</sup>

Smoking presents as a risk factor for COVID-19. Smokers are more susceptible to develop COVID-19 and they present with a more severe set of symptoms.<sup>11</sup> Previous studies have also shown the relationship between smoking and weight. People who quit smoking have more weight than both non-smokers and daily smokers.<sup>12</sup>

However, many studies have been conducted previously to determine the relationship between various lifestyle changes amid the time of COVID-19 in the general population but in this survey, we focused particularly the changes in lifestyle and dietary habits and subsequent weight gain in medical students during COVID-19.

## 2. Methods and materials

The survey was conducted online by using a structured questionnaire which was created by Google forms and was circulated (via social media) among the students of two medical colleges: 1) Ameer-ud-din Medical College, PGMI, Lahore. 2) King Edward Medical University, Lahore. In this survey our target population was 2000 medical students as total five year's MBBS students of King Edward Medical University are 1500 and of Ameer-ud-din Medical College Lahore are 500. The sample size was calculated from the software of [raosoft.com](http://raosoft.com) and was found to be a total of 323 medical students.<sup>13</sup> The confidence interval was set to 95% with a 5% margin of error so p-value less than 0.05 will be considered significant in this study. An online method for this survey was adopted because it was difficult to approach students in such a pandemic condition. The study was designed to be a comparative cross-sectional to compare the dietary and lifestyle changes before and during the quarantine. The survey was completed in ten days starting from 27th August to 5th September. The approval from the Ethical Review Committee of Ameer-ud-din Medical College, PGMI, Lahore was taken. All the ethical standards of APA were strictly followed before and during the conduction of the study. All the participants were fully informed about study requirements. Confidentiality was ensured and consent was taken from participants to partake in this study.

### 2.1. Instruments and variables

The questionnaire included a total of 45 questions divided into 5 sections. 1-Consent 2- Demographic information included name (optional), age, gender, and college name. 3-Anthropometrics information (weight: 2 questions) 4-Changes in dietary habits (24 questions) 5- Lifestyle changes (14 questions). Chief Minister of Punjab announces lockdown in Punjab on 21st March.<sup>14</sup> So, all the questions related to anthropometrics, dietary habits and lifestyle changes were subdivided into two sections of before quarantine and after quarantine to evaluate changes in these parameters.

Subjects were asked to write their weight in kilograms before and after quarantine in the anthropometric section.

In the section of dietary habits, a total of 16 questions were close-ended out of which 8 questions before quarantine and 8 questions during the quarantine. All these questions were related to a nutritionally balanced diet in which they were asked

whether they consume 2–3 servings/day of vegetables each of which = 200 g, 2–4 servings/day of fruits each of which = 80 g, 1 teaspoon of salt daily, 6–8 teaspoons of sugar daily, 4–6 tablespoons of oil daily, chicken as a part of the daily diet, 3–4 servings of legumes/week each of which = 120 g, 7–8 glasses of water/day. This section also included a total of 7 open-ended questions out of which 3 were related to before quarantine and 4 during quarantine in which they were asked how much bread slices, eggs and milk they consumed daily. One additional question was asked whether their daily calorie intake is increased, decreased or remained the same during the quarantine.

In the section of lifestyle habits, a total of 8 questions were close-ended which include 4 questions before and 4 questions after quarantine. Subjects were asked whether they had a routine of playing 1-h outdoor games, 1-h indoor games, daily exercise and smoking. 6 questions were open-ended in which subjects were asked to write daily sleeping hours and daily working hours. Besides they were asked whether they had observed any change in lifestyle during the quarantine. They were asked if their physical activity had increased or decreased during the quarantine.

All the data collected were analyzed by the Statistical Package for Social Sciences (SPSS) version 26.0. Descriptive statistics including frequencies and percentages were calculated for age-groups, gender and institution. The variables of dietary habits and lifestyle changes were compared between before and during quarantine by using the paired sample t-test. The relation of weight during quarantine with lifestyle and dietary changes was measured by applying the Chi-square test. A p-value of less than 0.05 was considered significant.

### 3. Results

In total 323 participants, 94 (29.1%) students ranged between 15 and 20 years of age and remaining 229 (70.9%) students fell under the age-group of 20–30 years. The number of students from AMC and KEMU was 162 (50.2%) and 161 (49.8%) respectively including 181 (56%) females and 142 (44%) males as shown in Table 1.

#### 3.1. Anthropometrics

Before quarantine, the weight of 320 (99.1%) students was between 30 and 98 kgs. During quarantine, this range increased to 34–105 kgs for the same number of medical students i.e. 320 (99.1%). The difference in self-reported weight before and during

Table 1. Demographic details of study responders (n = 323).

Sr. No.	Variable	Frequency (%)
1-	Age Group	15-20: 94 (29.1%) 20-30: 229 (70.9%)
2-	Institute	AMC: 162 (50.2%) KEMU: 161 (49.8%)
3-	Gender	Male: 142 (44%) Female: 181 (56%)

quarantine was found significant ( $p = 0.000^*$ ) as shown in Table 2. Out of 323 students, more than half (64.5%) gained their weight during the quarantine. Only 22% of the total students lost their weight. Meanwhile, the weight remained unchanged in 10.5% of students.

#### 3.2. Changes in dietary habits

Of the total 323 students, 208 (64.1%) increased their calorie intake and 51 (15.8%) reduced their calorie intake during the quarantine. Meanwhile, it remained unchanged for the remaining 64 (19.8%) students (Fig. 1). The participants were asked to estimate their food intake before and during quarantine both qualitatively and quantitatively. It was observed that everyday consumption of sugar, oil, chicken and milk increased during quarantine and was found significant ( $p < 0.05$ ). Before quarantine, 174 (53.9%) students used 6–8 teaspoons of sugar

Table 2. Changes in weight before and during quarantine.

Sr. No.	Variable 1	Variable 2	p-value
1-	Weight before quarantine	Weight during quarantine	0.000*

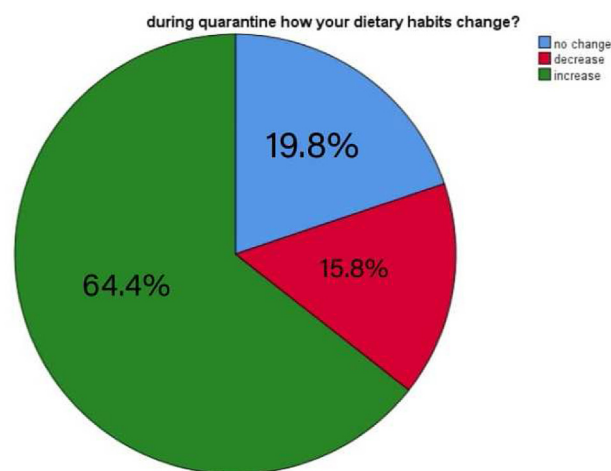


Fig. 1. Distribution of change in dietary habits during quarantine period.

daily in their diet and this percentage further increased to 63.2% during lockdown ( $p = 0.000^*$ ). The daily use of oil (4–6 tablespoons) increased from 77.1% to 83% during quarantine ( $p = 0.009^*$ ). Furthermore, the increase in daily milk intake during quarantine was also found significant ( $p = 0.002^*$ ). During lockdown 189 (58.5%) students consumed at least 1 glass of milk daily as compared to 183 (56.7%) before Quarantine. Likewise, daily chicken intake was increased from 64.7% to 70% in quarantine days and was found significant ( $p = 0.043^*$ ). In addition to that, there was also an increase in weekly legumes consumption (3–4 servings per week) from 56% of students before quarantining to 62.3% during quarantine ( $p = 0.013^*$ ). No significant change in water intake was observed before and during quarantine ( $p = 0.083$ ). Similarly, increased intake of fruits, vegetables, bread, eggs and salt were not found to be significant ( $p = 0.092$ ,  $p = 0.489$ ,  $p = 0.853$ ,  $p = 0.794$ ,  $p = 0.370$  respectively). Frequency (%) and  $p$  values are given in [Tables 3A and 3B](#).

### 3.3. Lifestyle changes during COVID'19

With regards to lifestyle changes during quarantine, 296 (91.6%) students had significantly changed their lifestyle and rest 27 (8.4%) had no change in their lifestyle as given in [\(Fig. 2A\)](#). Sleeping duration prolongation, decreased outdoor games, decrease in a work duration, and change in smoking attitude was found significant during quarantine ( $p < 0.05^*$ )

as given in [Table 4A and 4B](#). As for sleeping habits, the frequency of students who sleep more than 9 h increased from 14 (4.3%) before quarantine to 110 (34.1%) during the quarantine. Decreased outdoor games were also found significant ( $p = 0.000^*$ ). Before quarantine, 102 (31.6%) respondents used to play outdoor games and during quarantine, only 38 (11.8%) students played outdoor games. This pandemic situation also greatly affected the daily working hours of the people. Before quarantine, 207 (64.1%) participants worked less than 8 h and during quarantine, 252 (78%) students worked less than 8 h daily ( $p = 0.000^*$ ). The decrease in smoking was significant ( $p = 0.028^*$ ). Percentage of smokers was reduced from 7.4% (before quarantine) to 6.8% (during quarantine). In addition to a decrease in outdoor games, a little bit decrease in indoor games and exercise during quarantine was also observed but it was not found significant ( $p > 0.05$ ) as mentioned in [\(Table 4A and 4B\)](#). Majority of the students (91.6%) reported a clear change in their lifestyle during quarantine while only 8.4% did not observe any change in their lifestyle as shown in [\(Fig. 2A\)](#). The physical activity of a greater percentage of participants (83.9%) reduced and it increased only for a small fraction of students (16.1%) during COVID '19 [\(Fig. 2B\)](#).

## 4. Discussion

This study demonstrates novel information regarding the change in dietary habits and lifestyle

Table 3A. Frequency of food items intake before and during quarantine.

Sr. No.	Food items intake	Frequency (%) before the quarantine	Frequency (%) during the quarantine
1-	Daily Sugar intake (6–8 teaspoons)	174 (53.9%)	204 (63.2%)
2-	Daily Oil intake (4–6 tablespoons)	249 (77.1%)	268 (83%)
3-	Daily chicken intake	183 (56.7%)	189 (58.5%)
4-	Daily milk intake (at least 1 glass)	209 (64.7%)	226 (70%)
5-	Weekly legumes intake (3–4 servings)	181 (56%)	203 (62.8%)

Table 3B. Comparison of food items take before and during quarantine.

Sr. No.	Food items intake before the quarantine	Food items intake during the quarantine	p-value
1-	Sugar intake before the quarantine	Sugar intake during the quarantine	0.000*
2-	Oil intake before the quarantine	Oil intake during the quarantine	0.009*
3-	Chicken intake before the quarantine	Chicken intake during the quarantine	0.043*
4-	Milk intake before the quarantine	Milk intake during the quarantine	0.002*
5-	Legumes intake before the quarantine	Legumes intake during the quarantine	0.013*
6-	Water intake before the quarantine	Water intake during the quarantine	0.083
7-	Fruits intake before the quarantine	Fruits intake during the quarantine	0.092
8-	Vegetable intake before the quarantine	Vegetable intake during the quarantine	0.498
9-	Bread intake before the quarantine	Bread intake during the quarantine	0.853
10-	Eggs intake before the quarantine	Eggs intake during the quarantine	0.794
11-	Salt intake before the quarantine	Salt intake during the quarantine	0.370

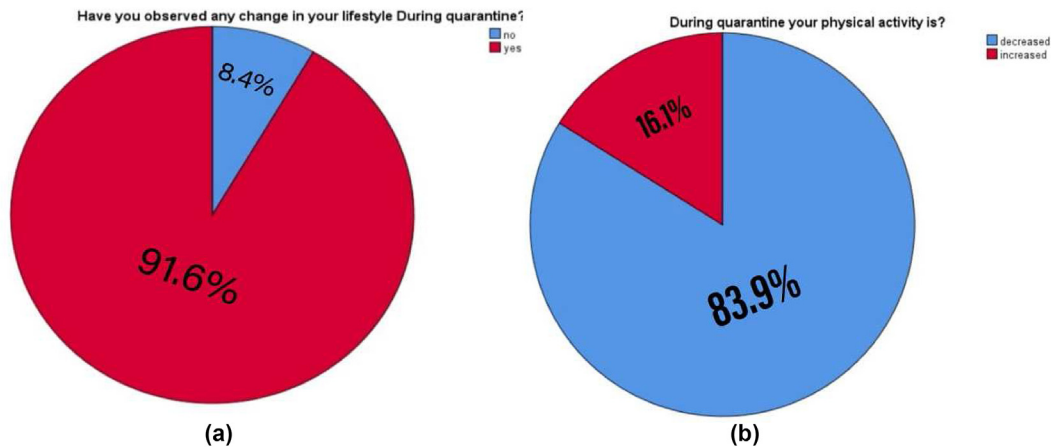


Fig. 2. A: Distribution of change in lifestyle during quarantine. B: Distribution of changes in physical activity during quarantine.

Table 4A. Changes in lie style before and during quarantine.

Sr. No.	Lifestyle before quarantine	Lifestyle during quarantine	p-value
1-	Sleep duration before the quarantine	Sleep duration during the quarantine	0.000*
2-	Outdoor games duration before the quarantine	Outdoor games duration during the quarantine	0.000*
3-	Indoor games duration before the quarantine	Indoor games duration during the quarantine	0.655
4-	Exercise before quarantine	Exercise during quarantine	0.056
5-	Work duration before the quarantine	Work duration during the quarantine	0.000*
6-	Smoking before quarantine	Smoking during quarantine	0.028*

Table 4B. Comparison of lifestyle modification before and during quarantine.

Sr. No.	Lifestyle modifications	Frequency (%) before the quarantine	Frequency (%) during the quarantine
1-	Sleep duration (more than 9 h)	14 (4.3%)	110 (34.1%)
2-	Outdoor games	102 (31.6%)	38 (11.8%)
3-	Work duration (less than 8 h)	207 (64.1%)	252 (78%)
4-	Smoking attitude	24 (7.4%) were smokers	22 (6.8%) decreased smoking

in students of medical colleges of Lahore during the quarantine period of COVID'19. The outcome of this study represents changes in eating behavior and lifestyle including physical activity, sleeping and smoking habits. The alterations in most of these parameters promote weight gain which was found significant. It was recorded that among the sample of 323 students, 64.5% gained their weight, 22% lost weight and 10.5% reported no change in weight. More than half (64.5%) of these students increased their calorie intake during the quarantine period of COVID'19. To strengthen the immune system, different food groups must be a part of a daily balanced diet include fruits, vegetables, bread, eggs, chicken, milk, sugar, salt, oil and legumes etc. COVID'19 information for nutritional support was published by the European Federation of Association of Dietitians (EFAD) to boost up the immune system under such stressful condition.<sup>15</sup> In this regard, the students should take these substances in appropriate portions. In this study, it was observed

that most of the students increased using chicken, milk, sugar, oil and legumes and an increase in intake of all these substances was found significant. However, increased intake of fruits, vegetables, bread and salt was not found significant in this study. On the other hand, a change in lifestyle of 91.6% of students was reported during COVID'19 period which was also found significant. Sleeping duration prolongation decreased outdoor games, working hours and physical activity, and change in smoking habits were also reported to be significant. However, changes in indoor games and exercise duration were not significant.

To maintain a healthy life and to enhance the immune system, especially in this pandemic, it is important to consume a variety of food in their specific proportions.<sup>16-18</sup> Different food groups that must be a part of a daily balanced diet include fruits, vegetables, bread, eggs, chicken, milk, sugar, oil and legumes etc. In this study, it was assessed that students increased the intake of chicken, milk and

reciprocally, it leads to increased calorie intake. Fresh fruits and vegetables contain fibers and micronutrients like beta-carotene, vitamin C, and vitamin E that can boost immune function but, in this study, students consumed these items less than the expected value due to limited access to markets because of strict lockdown issues. Many previous studies have shown that less usage of fruits, vegetables and other high fiber diet weakens the immune function of the body which contributes to weight gain that can further lead to obesity.<sup>19,20</sup> Boredom, social isolation and updates of increase in coronavirus cases intensified stress among students which lead to food cravings for high sugar diet especially containing simple carbohydrates.<sup>21,22</sup> Carbohydrates stimulate the increased production of serotonin that reduces stress level.<sup>23</sup> It is important to increase physical activity, get proper sleep and stop smoking to enhance the immune power of the body. Physical activity includes indoor games, outdoor games, body exercise etc. In our study, physical activity and outdoor games of respondents decreased significantly which is well understood by the fact that to maintain social distancing, playing outdoor games and gym centers were restricted. Moreover, all the educational institutions remained close during the pandemic period which decreased the daily working hours of students as the hectic routine was converted to only digital education. Decreased physical activity may greatly dis-regulate the fat metabolism of the body leading to weight gain<sup>10</sup>. However, a decrease in duration of indoor games and exercise was also observed but not significant. Only a small percentage of students were smokers before quarantine and they decreased smoking due to fear of getting infected since it weakens the body defense system.<sup>24</sup> Daily smokers generally have lower BMI and weight than non-smokers.<sup>25</sup> After the cessation of smoking, most of the people gain weight.<sup>26</sup> People who quit smoking gain more weight than both daily smokers and non-smokers.<sup>12</sup>

Studies related to Lifestyle changes and dietary habits due to COVID'19 have been conducted in many countries in the general population.<sup>27,28</sup> These studies show that changes in these parameters cause gain in weight and subsequent obesity. Increase in weight and obesity due to dietary and lifestyle changes were observed by calculating BMI in these studies but in our study, we just analyzed the effects of dietary habits and other lifestyle changes and its impact on body weight. Moreover, sleeping duration was observed to be increased in students of this study which was found to be decreased.<sup>29,30</sup>

The outcome of this study is weight gain that may prove beneficial in planning future policies in control of subsequent obesity in youngsters providing a healthy dietary and lifestyle plan in case of incoming pandemics and deadly conditions like this.

This study has some limitations. Firstly, we could not approach the students physically and all the data was self-reported. Secondly, the study was conducted only on the students of two medical colleges and not on the general population. Thirdly, we couldn't find the basis of weight gain in dietary groups which were significant so further studies can be conducted in future to find a significant relation of weight gain with either lifestyle or dietary changes in these groups.

In a nutshell, the weight is increased due to a change in dietary habits and lifestyle. This gain in weight may be due to increased consumption of sugar, oil, milk, chicken and legumes as they are all found significant in this study. However, a direct association of weight gain with these dietary items is not well-understood which can be further clarified by future studies. Weight gain can also be correlated with a decrease in physical activity, outdoor games and smoking habits. This study can help control weight gain and obesity in future pandemics and situations like this by providing appropriate dietary and lifestyle plans.

## 5. Conclusion

Weight gain during quarantine was found significant when compared to the weight of respondents before quarantine due to dietary habits and lifestyle changes during COVID'19 pandemic. Further prolongation of strict lockdown may exacerbate the already existing problem of weight gain in students. Therefore, the government should consider proper nutrition and lifestyle plans by conducting education-based programs in schools and colleges.

## Author's contribution

Adnan Gulzar designed the study and formalized the theoretical framework, Anosh Javed and Daniyal javed help in data collection and wrote the original draft of the manuscript. Amna Liaquat collected and analyzed data. All the authors have a final read and agreed to the published version of the manuscript.

## Funding

The research received no external funding.

## Conflict of interest

The authors state that there is no conflict of interest.



## Acknowledgement

The authors are thankful to the students who actively participated in this study, fellows and the ethical review committee of Ameer-ud-din Medical College, PGMI, Lahore for their support.

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