Evaluation of Health-Related Quality of Life of Covid-19 Patients: A Hospital-Based Study in South Central Ethiopia

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Abstract

Background: Covid-19 causes a wide range of symptoms in patients, ranging from mild manifestations to severe disease and death. This study assessed the health-related quality of life (HRQOL) and associated factors of Covid-19 patients using primary data from confirmed cases in South Central Ethiopia.

Methods: We employed a facility-based, cross-sectional study design and conducted the study at the Bokoji Hospital Covid-19 treatment centre. A structured questionnaire and the EQ-5D-3L scale were used to collect the data for analysis. The HRQOL results measured by the EQ-5D-3L tool were converted to a health state utility (HSU) using the Zimbabwe tariff. The average health utility index and HSU–visual analogue scale across diverse sociodemographic and clinical characteristics were compared using the Mann-Whitney U test or Kruskal-Wallis test. We employed a multiple linear regression to examine the associations of predictor variables with HSU values simultaneously. The data were analysed using STATA version 15.

Results: The overall mean HSU score from the EQ-5D was 0.688 (SD: 0.285), and the median was 0.787 (IQR: 0.596, 0.833). The mean HSU from the visual analogue scale score was 0.69 (SD: 0.129), with a median of 0.70 (IQR: 0.60, 0.80). Those who received dexamethasone and intranasal oxygen supplement, those with comorbidity, those older than 55 years and those with a hospital stay of more than 15 days had significantly lower HSU scores than their counterparts (p<.001).

Conclusion: Covid-19 substantially impaired the HRQOL of patients in Ethiopia, especially among elderly patients and those with comorbidity. Therefore, clinical follow-up and psychological treatment should be encouraged for these groups. Moreover, the health utility values from this study can be used to evaluate quality adjusted life years for future cost-effectiveness analyses of prevention and treatment interventions against Covid-19.

Introduction

Coronavirus disease 2019 (Covid-19) is an infectious disease first discovered in China's Wuhan Province in December 2019. According to the World Health Organization (WHO) (April 20, 2021), more than 140 million cases and over 3 million deaths have been globally attributed to Covid-19 [1]. In Ethiopia, the first cases of Covid-19 were reported on March 13, 2020. An Ethiopian Ministry of Health report states that more than 240,000 cases and 3,370 deaths have been reported [1]. The pandemic is causing a broad range of health, social and economic crises at a macro and micro level [2].

Covid-19's wide spectrum of symptoms ranges from mild manifestations to severe disease and death, and some people may have the disease without developing symptoms. The most common symptoms are upper respiratory tract conditions (sore throat, cold symptoms, mild cough), muscle pain and generally feeling unwell. Stomach pains and diarrhoea may occur in some cases, and the loss of the senses of taste and smell is also reported. Some patients may develop pneumonia with severe breathing difficulties, cough and fever and may need to be admitted to intensive care treatment units. Examination of the lungs usually finds changes consistent with viral pneumonia. Death is common among older people, particularly among the elderly with underlying diseases, but death can also occur among people without known risk factors [3, 4].

Health-related quality of life (HRQOL), an essential health care indicator for any disease type [5], measures patients’ overall wellbeing in physical, mental and emotional aspects at a specific time. It can be used in evaluating the severity of a disease, treatment outcomes, patient satisfaction with care, quality of services, overall patient wellbeing and the cost-utility of interventions targeting the disease [5–8]. As Covid-19 is a new disease, however, little is known about its impact on HRQOL. In Italy, a retrospective analysis of HRQOL using SF-36 and involving 673 cases one month after discharge from San Salvatore Hospital in Pesaro found that Covid-19 caused a substantial reduction in patients' physical and mental health conditions. That study indicates that physical and emotional roles, vitality and social functioning were highly affected dimensions [9]. A retrospective study in China indicates that Covid-19 has a substantial impact on the physical and psychological dimensions of HRQOL [10]. Another multicentre follow-up study from China indicates that Covid-19 has a substantial effect on HRQOL, with some impacts persisting more than three months after discharge [11].

An HRQOL study using EQ-5D on a multi-ethnic Asian population in Singapore among Covid-19 and cardiovascular comorbid patients indicates that the mental health dimension of patient wellbeing was the most affected area [12]. An HRQOL study from Iran using the EQ-5D reports a significantly low HRQOL score among Covid-19 patients (0.6125) and indicates that socioeconomic factors (i.e., gender, age, educational status, employment status) and comorbidity status (i.e., having diabetes or cardiovascular disease) were significant predictors of HRQOL score [13].
Covid-19’s impact on HRQOL varies from country to country due to socioeconomic factors, the treatment modalities offered (and their outcomes) and variations in the disease’s severity and epidemiology [6]. However, although local evidence of the impact of Covid-19 on HRQOL is essential to inform national and regional Covid-19 treatment protocol designs, the disease’s impact on HRQOL in the Ethiopian or African context was unknown. Therefore, this study assessed the impact of Covid-19 and associated factors on HRQOL using primary data from confirmed cases in a Covid-19 treatment centre in South Central Ethiopia.

Methods

Study design and population

This study employed a facility-based, cross-sectional study design. We conducted this study in the Arsi Zone at the Bokoji Hospital Covid-19 treatment centre, one of the largest Covid-19 treatment centres in South Central Ethiopia, which provides services for people from 28 districts and two town administrations. All 398 Covid-19 patients discharged from the treatment centre from July 1, 2020 through March 20, 2021 were included. All the Covid-19 patients referred to other hospitals or deceased were excluded from the analysis.

Data collection and tools

To measure the HRQOL of Covid-19 patients, we employed the visual analogue scale (VAS) alongside the EQ-5D-3L questionnaire, which is the most common instrument for assessing HRQOL. The EQ-5D-3L includes five dimensions (mobility, self-care, usual activities, pain/discomfort, anxiety/depression), each with three levels to define possible health states (no problems, some problems, inability to/extreme problems). The VAS is a vertical graduated line (0–100) that indicates the overall health status of the respondent, 0 being the worst imaginable health state and 100 being the best imaginable. Four nurses collected the data after a two-day training on data collection procedures and the tools. Data collection was conducted using a face-to-face interview. Additionally, information on sociodemographic and clinical characteristics was extracted from patients’ medical records. The first author (AK) supervised the data collection.

Data analysis

The primary variable of interest in this study was the HRQOL of Covid-19 patients. The HRQOL results measured by the EQ-5D-3L tool were converted to a health state utility (HSU) using the Zimbabwe tariff value set, while the VAS scores were taken directly as another HSU (HSU-VAS) [14]. Both the HUI from the EQ-5D-3L and the overall HSU-VAS from the VAS score were analysed as a continuous variables. We used frequencies and percentages to summarise the sociodemographic and clinical characteristics of the participants and summarised the HUIs by median with interquartile range (IQR) and mean with a standard deviation (SD). We compared the average HUI and HSU-VAS across various groups of sociodemographic and clinical characteristics using the Mann-Whitney U test or the Kruskal-Wallis test. To assess the associations of predictor variables with HSU simultaneously, we employed a multiple linear regression. We calculated coefficient ($\beta$) and 95% confidence intervals (CIs). A P-value of less than 0.05 was considered statistically significant. We used Microsoft Excel 2010 for data entry and STATA version 15 for data analysis.

Ethical approval

This study was approved by the Ethical Review Board of Arsi University College of Health Sciences. Informed consent was obtained from all the participants. We used the STROBE cross-sectional checklist when writing our report [15].

Results

A total of 398 confirmed Covid-19 cases were included in the study. The average length of hospital stay was 14.3 days. The majority of the Covid-19 cases were male (60%), older than 55 years (28.9%) and residents of urban areas (61%). Regarding general health status on admission, 32.7% were severely ill, 20% had a moderate symptom, 23.4% had mild symptoms and 23.9% were asymptomatic. Forty-five percent of the cases had some comorbidity, with diabetes mellitus’ (17.1%), hypertension (10.3%) and asthma (8.3%) being the top three comorbidities. Regarding the antibiotic treatment regimen, 37.2% were treated with azithromycin, while 32.9% received a combination of azithromycin and ceftriaxone. In addition, about one-third (29.1%) were treated with dexamethasone. Furthermore, nearly two-thirds (59.3%) received intranasal oxygen supplementation (Table 1).
The overall mean HSU of the EQ-5D index score was 0.688 (SD: 0.285), with a median of 0.787 (IQR: 0.596, 0.833) (Table 2). The overall mean HSU of the VAS score was 0.690 (SD: 0.129), with a median of 0.700 (IQR: 0.600, 0.800) (Table 3). There was significant variation in the mean HSU score across age groups (p < .001). The mean EQ-5D index score among those older than 55 years was 0.567, while it was 0.783 among those younger than 25 years. In general, the mean EQ-5D index scores were significantly lower for respondents with comorbidity (0.574) than for those without comorbidity (0.777) (p < .001) (Table 3). The EQ-5D index score was significantly lower among those with hypertension, chronic cardiac diseases, chronic pulmonary disease, asthma, chronic kidney disease and diabetes mellitus than among those who did not have those comorbidities. Those who received dexamethasone and supplemental intranasal oxygen had significantly lower EQ-5D index scores than those who did not receive them (p < .001), but there was no difference in the EQ-5D index score across gender and place of residence (urban vs. rural). The HSUs from the EQ-5D-3L results were consistent with the VAS results.

The multiple linear regression analysis results are presented in Table 4. The patient’s age, having asthma as comorbidity, and general health status during admission were significantly associated with low HSU values. On the other hand, those who were treated with dexamethasone had significantly higher HSU values (P-value < 0.05) (Table 4).

**Discussion**

Covid-19 has caused significant psychological and physiological stress to patients and their families worldwide. This study examined the HRQOL of Covid-19 patients using the EQ-5D-3L and VAS tools. The mean EQ-5D index score among Covid-19 patients on discharge was 0.688 (median = 0.787), and the overall mean VAS score was 0.690 (median = 0.700). The utility values from the EQ-5D were consistent with the results of the VAS in our study (Table 2 and Table 3). In general, these findings are in line with those of a study in Iran that reports an EQ-5D index score of 0.612 [13] and of a Belgian study with an EQ-5D index score of 0.620 [16], but our findings are substantially lower than those of studies from Norway (EQ-5D index score: 0.820) [17], China (EQ-5D index score: 0.949) and Hong Kong (EQ-5D index score: 0.897) [18, 19].

The variation in age distribution may be a driver of variation in HRQOL across countries, and the population in our study was relatively younger (mean age = 40) than in other places. Age was also a significant predictor of health utility status for Covid-19 patients in our study (Table 4). Older people had a significantly lower HRQOL than younger people, a finding in line with those of studies in Saudi Arabia and Argentina [20, 21]. This variation may be due to increased mental stress, comorbidity and debilitation in the physical condition of older people [22]. Variations in the HRQOL evaluation method employed (i.e., health utility tariff, tools, scale, study participant sampling) may also, to some extent, contribute to the discrepancy. The studies in Italy and China employed the SF-36 instrument, and those in Iran, Argentina, Belgium and Norway employed the EQ-5D-5L instrument, while the Saudi Arabian study, by contrast, employed the WHO’s 12-item Quality of Life instrument.

According to our study, comorbidity, especially asthma (Table 4), is a significant predictor of low health utility scores (Table 2). The mean EQ-5D index scores were significantly lower for respondents with comorbidity (0.574) than for those without it (0.777) (p < .001). In general, comorbidities (such as hypertension, chronic cardiac diseases, chronic pulmonary disease, asthma, chronic kidney disease and diabetes mellitus) were significant predictors of low EQ-5D scores. Studies from Vietnam [23], Saudi Arabia [20] and China [18] reveal that individuals with chronic diseases have a lower HRQOL than those without comorbid disease, perhaps because those with comorbidities develop anxiety or depression in response to misinformation disseminated about the impact of the virus in these communities [20, 24].

We found that Covid-19 patients who received dexamethasone and intranasal oxygen supplementation had lower EQ-5D index scores than those who did not receive them (p < .001), perhaps because those who needed those treatments had a severe form of the illness. Furthermore, those with a length of stay (LOS) of more than 15 days in hospital had lower EQ-5D index scores than their counterparts. Studies from China and Argentina also revealed that increased LOS is associated with poor HRQOL [10, 21, 25]. This poor HRQOL might be due to confinement to one place, increasing anxiety and reducing the HRQOL in general.

To the best of our knowledge, this study represents the first comprehensive analysis of the HRQOL of Covid-19 patients in the Ethiopian setting. We conducted the study in a setting that accommodated patients from 28 districts so that the results can be generalised to similar settings. However, our study has some limitations. First, because the study collected HRQOL data based on patient preferences, the patients may have underestimated or overestimated their status during the interview. In addition, this study used the Zimbabwe tariff due to the lack of an Ethiopian tariff, and this limitation could impact the estimation of the real Ethiopian HRQOL against the
disease, as there are many differences between the two countries. Moreover, due to the study's cross-sectional design, we could not compare the HRQOL of patients before the Covid-19 infection.

Conclusion

In conclusion, Covid-19 disease substantially impaired the HRQOL of patients in Ethiopia. Elderly patients and Covid-19 patients with comorbidity had notably poor HRQOLs. Therefore, close clinical follow-up and psychological treatment should be encouraged for these groups. Moreover, the health utility values from this study can be used to evaluate quality adjusted life years for future cost-effectiveness analyses of prevention and treatment interventions against Covid-19.

Abbreviations

EQ-5D-3L: Euro Qal–5 Dimension–3 Level; HRQOL: health-related quality of life; HIV: human immune virus; HUI: health utility index; HSU: health state utility; LOS: length of stay; ICU: intensive care unit; SD: standard deviation; SF-36: standard format–36; VAS: visual analogue scale; WHO: World Health Organization

Declarations

Ethics approval and consent to participate

Ethical clearance was obtained from the Arsi University College of Health Sciences Research Ethics Review Board, and written permission was obtained from the Covid-19 treatment centre administration before data collection was started.

Consent for publication

Not applicable

Availability of data and material

The data sets used or analysed in this study are available from the corresponding author upon reasonable request.

Competing interests

The authors declare that they have no competing interests.

Funding

Not applicable

Authors’ contributions

AK, GA, TK, ZH, AH and HA designed and worked on the study protocols. GA, TK, ZH and AK prepared a data collection tool and trained the data collectors. AK supervised the data collection process. AK, GA and HA entered data into SPSS. AK, GA and AH analysed the data, interpreted the results and wrote the manuscript's draft and final version. All the authors read and approved the final manuscript.

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Tables
| Demographic and clinical characteristics | Frequency (%) |
|-----------------------------------------|---------------|
| Sex                                     |               |
| Female                                  | 159 (40.0)    |
| Male                                    | 239 (60.0)    |
| Age (mean ± SD = 40.0 ± 20.7)           |               |
| 0–24 years                              | 98 (24.6)     |
| 25–34                                   | 89 (22.3)     |
| 35–44                                   | 50 (12.6)     |
| 45–54                                   | 46 (11.6)     |
| 55 years and above                      | 115 (28.9)    |
| Residence                               |               |
| Rural                                   | 156 (39.0)    |
| Urban                                   | 242 (61.0)    |
| Health status on admission              |               |
| Asymptomatic                            | 95 (23.9)     |
| Mild                                    | 93 (23.4)     |
| Moderate                                | 80 (20.0)     |
| Severe                                  | 130 (32.7)    |
| Comorbidity                             |               |
| Yes                                     | 179 (45.0)    |
| No                                      | 219 (55.0)    |
| Type of comorbidity                     |               |
| Diabetes mellitus                       | 68 (17.1)     |
| Hypertension                            | 41 (10.3)     |
| Asthma                                  | 33 (8.3)      |
| Chronic pulmonary disease               | 30 (7.5)      |
| Chronic cardiac diseases                | 23 (5.8)      |
| Malignancy                              | 11 (2.8)      |
| Chronic kidney disease                  | 7 (1.8)       |
| HIV/AIDS                                | 6 (1.5)       |
| Types of antibiotic administered        |               |
| Azithromycin only                       | 148 (37.2)    |
| Azithromycin + ceftriaxone              | 131 (32.9)    |
| Azithromycin + vancomycin + ceftazidime | 50 (12.6)     |
| Azithromycin + ceftriaxone + metronidazole | 30 (7.5)  |
| Azithromycin + ceftriaxone + vancomycin | 24 (6.0)      |
| Demographic and clinical characteristics | Frequency (%) |
|-----------------------------------------|---------------|
| Azithromycin + ceftriaxone + amoxicillin | 13 (3.3)      |
| Azithromycin + ceftriaxone + ceftazidime | 2 (0.5)       |

Dexamethasone used

|               | Frequency (%) |
|---------------|---------------|
| Yes           | 116 (29.1)    |
| No            | 282 (70.9)    |

Intranasal oxygen used

|            | Frequency (%) |
|------------|---------------|
| Yes        | 162 (59.3)    |
| No         | 236 (40.7)    |

Length of hospital stay (mean ± SD = 14.3 ± 4.8)

|               | Frequency (%) |
|---------------|---------------|
| 1–7 days      | 12 (3.0)      |
| 8–14 days     | 248 (61.8)    |
| 15–21 days    | 113 (28.4)    |
| 22–28 days    | 13 (3.3)      |
| More than 28 days | 14 (5.5)  |
| Variable            | Median | IQR (P25, P75) | Mean  | SD    | SE    | P-value |
|---------------------|--------|----------------|-------|-------|-------|---------|
| **Health utility value (EQ-5D-3L)** |         |                |       |       |       |         |
| Sex                 |         |                |       |       |       |         |
| Female              | 0.787   | 0.596          | 0.833 | 0.684 | 0.024 | 0.818   |
| Male                | 0.787   | 0.596          | 0.854 | 0.689 | 0.017 |         |
| Age                 |         |                |       |       |       |         |
| 0–24                | 0.787   | 0.596          | 1.000 | 0.783 | 0.020 | < 0.001 |
| 25–34               | 0.787   | 0.596          | 1.000 | 0.778 | 0.022 |         |
| 35–44               | 0.787   | 0.596          | 0.787 | 0.649 | 0.046 |         |
| 45–54               | 0.691   | 0.596          | 0.854 | 0.653 | 0.046 |         |
| 55+                 | 0.596   | 0.596          | 0.787 | 0.567 | 0.029 |         |
| Residence           |         |                |       |       |       |         |
| Rural               | 0.787   | 0.596          | 0.854 | 0.692 | 0.022 | 0.967   |
| Urban               | 0.787   | 0.596          | 0.833 | 0.685 | 0.018 |         |
| Comorbidity         |         |                |       |       |       |         |
| No                  | 0.787   | 0.596          | 1.000 | 0.777 | 0.017 | < 0.001 |
| Yes                 | 0.596   | 0.596          | 0.787 | 0.574 | 0.021 |         |
| Hypertension        |         |                |       |       |       |         |
| No                  | 0.787   | 0.596          | 0.854 | 0.699 | 0.015 | 0.001   |
| Yes                 | 0.596   | 0.596          | 0.787 | 0.580 | 0.042 |         |
| Chronic cardiac diseases |     |                |       |       |       |         |
| No                  | 0.787   | 0.596          | 0.854 | 0.697 | 0.014 | 0.004   |
| Yes                 | 0.596   | 0.596          | 0.787 | 0.518 | 0.067 |         |
| Chronic pulmonary disease |   |                |       |       |       |         |
| No                  | 0.787   | 0.596          | 0.854 | 0.703 | 0.014 | < 0.001 |
| Yes                 | 0.596   | 0.596          | 0.596 | 0.499 | 0.057 |         |
| Asthma              |         |                |       |       |       |         |
| No                  | 0.787   | 0.596          | 0.854 | 0.706 | 0.014 | < 0.001 |
| Yes                 | 0.596   | 0.469          | 0.596 | 0.487 | 0.057 |         |
| Chronic kidney disease |       |                |       |       |       |         |
| No                  | 0.787   | 0.596          | 0.854 | 0.690 | 0.014 | 0.029   |
| Yes                 | 0.596   | 0.361          | 0.596 | 0.535 | 0.070 |         |

SD = standard deviation; IQR = interquartile range; SE = standard error of the mean;
P-values are from the Mann-Whitney U test or Kruskal-Wallis test; * indicates significance at the 95% confidence level, and ** indicates significance at the 99% confidence level.
| Health utility value (EQ-5D-3L) | No | 0.787 | 0.596 | 1.000 | 0.711 | 0.281 | 0.015 | < 0.001 |
|----------------------------------|----|--------|--------|--------|--------|--------|--------|---------|
|                                  | Yes| 0.596  | 0.596  | 0.787  | 0.575  | 0.280  | 0.033  |          |
| Malignancy                       | No | 0.787  | 0.596  | 0.854  | 0.687  | 0.288  | 0.014  | 0.859   |
|                                  | Yes| 0.787  | 0.596  | 0.833  | 0.708  | 0.147  | 0.044  |          |
| HIV/AIDS                         | No | 0.787  | 0.596  | 0.843  | 0.688  | 0.285  | 0.014  | 0.354   |
|                                  | Yes| 0.692  | 0.596  | 0.787  | 0.607  | 0.270  | 0.110  |          |
| Dexamethasone used               | No | 0.787  | 0.596  | 1.000  | 0.735  | 0.280  | 0.016  | < 0.001 |
|                                  | Yes| 0.596  | 0.596  | 0.787  | 0.571  | 0.262  | 0.024  |          |
| Intranasal oxygen used           | No | 0.787  | 0.787  | 1.000  | 0.816  | 0.180  | 0.011  | < 0.001 |
|                                  | Yes| 0.596  | 0.596  | 0.596  | 0.500  | 0.305  | 0.024  |          |
| Length of hospital stay          | 1–7 days | 0.691  | 0.596  | 0.866  | 0.718  | 0.227  | 0.065  | 0.002   |
|                                  | 8–14 days | 0.787 | 0.596  | 1.000  | 0.719  | 0.283  | 0.018  |          |
|                                  | 15–21 days | 0.596 | 0.596  | 0.787  | 0.622  | 0.297  | 0.027  |          |
|                                  | 22–28 days | 0.596 | 0.596  | 0.787  | 0.715  | 0.197  | 0.054  |          |
|                                  | More than 28 days | 0.596 | 0.469  | 0.787  | 0.604  | 0.241  | 0.064  |          |
|                                  | Overall | 0.787  | 0.596  | 0.833  | 0.688  | 0.285  | 0.014  |          |

SD = standard deviation; IQR = interquartile range; SE = standard error of the mean;
P-values are from the Mann-Whitney U test or Kruskal-Wallis test; * indicates significance at the 95% confidence level, and ** indicates significance at the 99% confidence level.
Table 3
Comparison of the HSU values of the VAS across the demographic and clinical characteristics of Covid-19 patients admitted to a treatment centre in the Arsi Zone, 2020–2021.

| Variable             | Health utility value (VAS) | Median | IQR (P25, P75) | Mean  | SD    | SE    | P-value |
|----------------------|----------------------------|--------|----------------|-------|-------|-------|---------|
| **Sex**              |                            |        |                |       |       |       |         |
| Female               |                            | 0.700  | 0.600          | 0.800 | 0.689 | 0.134 | 0.011   | 0.961   |
| Male                 |                            | 0.700  | 0.600          | 0.800 | 0.692 | 0.127 | 0.008   |         |
| **Age**              |                            |        |                |       |       |       |         |
| 0–24                 |                            | 0.725  | 0.610          | 0.860 | 0.732 | 0.126 | 0.013   | < 0.001 |
| 25–34                |                            | 0.750  | 0.650          | 0.840 | 0.734 | 0.121 | 0.013   |         |
| 35–44                |                            | 0.700  | 0.580          | 0.780 | 0.686 | 0.126 | 0.018   |         |
| 45–54                |                            | 0.680  | 0.600          | 0.780 | 0.678 | 0.123 | 0.018   |         |
| 55+                  |                            | 0.620  | 0.560          | 0.710 | 0.629 | 0.118 | 0.011   |         |
| **Residence**        |                            |        |                |       |       |       |         |
| Rural                |                            | 0.700  | 0.600          | 0.810 | 0.695 | 0.132 | 0.010   | 0.927   |
| Urban                |                            | 0.700  | 0.600          | 0.790 | 0.688 | 0.128 | 0.008   |         |
| **Comorbidity**      |                            |        |                |       |       |       |         |
| No                   |                            | 0.750  | 0.640          | 0.850 | 0.738 | 0.129 | 0.008   | < 0.001 |
| Yes                  |                            | 0.620  | 0.570          | 0.710 | 0.632 | 0.103 | 0.007   |         |
| **Hypertension**     |                            |        |                |       |       |       |         |
| No                   |                            | 0.700  | 0.600          | 0.800 | 0.697 | 0.131 | 0.007   | 0.002   |
| Yes                  |                            | 0.610  | 0.580          | 0.700 | 0.634 | 0.096 | 0.015   |         |
| **Chronic cardiac diseases** |            |        |                |       |       |       |         |
| No                   |                            | 0.700  | 0.600          | 0.800 | 0.695 | 0.129 | 0.006   | 0.005   |
| Yes                  |                            | 0.630  | 0.570          | 0.700 | 0.613 | 0.102 | 0.021   |         |
| **Chronic pulmonary disease** |            |        |                |       |       |       |         |
| No                   |                            | 0.700  | 0.600          | 0.800 | 0.697 | 0.130 | 0.007   | < 0.001 |
| Yes                  |                            | 0.605  | 0.570          | 0.660 | 0.606 | 0.081 | 0.015   |         |
| **Asthma**           |                            |        |                |       |       |       |         |
| No                   |                            | 0.700  | 0.600          | 0.800 | 0.699 | 0.129 | 0.006   | < 0.001 |
| Yes                  |                            | 0.590  | 0.560          | 0.640 | 0.601 | 0.096 | 0.017   |         |

SD = standard deviation; IQR = interquartile range; SE = standard error of the mean;
P-values are from the Mann-Whitney U test or Kruskal-Wallis test; * indicates significance at the 95% confidence level, and ** indicates significance at the 99% confidence level.
| Health utility value (VAS)                   |       |       |       |       |       |       |       |
|---------------------------------------------|-------|-------|-------|-------|-------|-------|-------|
| Chronic kidney disease                      |       |       |       |       |       |       |       |
| No                                          | 0.700 | 0.600 | 0.800 | 0.692 | 0.129 | 0.006 | 0.081 |
| Yes                                         | 0.630 | 0.550 | 0.660 | 0.607 | 0.094 | 0.035 |       |
| Diabetes mellitus                           |       |       |       |       |       |       |       |
| No                                          | 0.705 | 0.600 | 0.820 | 0.705 | 0.129 | 0.007 | < 0.001 |
| Yes                                         | 0.700 | 0.570 | 0.700 | 0.622 | 0.109 | 0.013 |       |
| Malignancy                                  |       |       |       |       |       |       |       |
| No                                          | 0.700 | 0.600 | 0.800 | 0.691 | 0.130 | 0.006 | 0.782 |
| Yes                                         | 0.710 | 0.600 | 0.780 | 0.675 | 0.117 | 0.035 |       |
| HIV/AIDS                                    |       |       |       |       |       |       |       |
| No                                          | 0.700 | 0.600 | 0.800 | 0.691 | 0.129 | 0.006 | 0.531 |
| Yes                                         | 0.665 | 0.590 | 0.750 | 0.653 | 0.112 | 0.046 |       |
| Dexamethasone used                          |       |       |       |       |       |       |       |
| No                                          | 0.730 | 0.610 | 0.848 | 0.718 | 0.131 | 0.007 | < 0.001 |
| Yes                                         | 0.600 | 0.570 | 0.700 | 0.625 | 0.097 | 0.009 |       |
| Intranasal oxygen used                      |       |       |       |       |       |       |       |
| No                                          | 0.750 | 0.695 | 0.850 | 0.749 | 0.116 | 0.007 | < 0.001 |
| Yes                                         | 0.600 | 0.560 | 0.660 | 0.604 | 0.096 | 0.007 |       |
| Length of hospital stay                     |       |       |       |       |       |       |       |
| 1–7 days                                    | 0.690 | 0.610 | 0.820 | 0.703 | 0.133 | 0.038 | 0.004 |
| 8–14 days                                   | 0.720 | 0.600 | 0.820 | 0.709 | 0.229 | 0.008 |       |
| 15–21 days                                  | 0.640 | 0.590 | 0.730 | 0.657 | 0.122 | 0.011 |       |
| 22–28 days                                  | 0.640 | 0.600 | 0.750 | 0.687 | 0.127 | 0.035 |       |
| More than 28 days                           | 0.615 | 0.530 | 0.730 | 0.629 | 0.131 | 0.034 |       |
| Overall                                     | 0.700 | 0.600 | 0.800 | 0.690 | 0.129 | 0.006 |       |

SD = standard deviation; IQR = interquartile range; SE = standard error of the mean;
P-values are from the Mann-Whitney U test or Kruskal-Wallis test; * indicates significance at the 95% confidence level, and ** indicates significance at the 99% confidence level.
Table 4
Multiple linear regression analysis for factors associated with HSU values of Covid-19 patients admitted to a treatment centre in the Arsi Zone, 2020–2021.

| Variables                                          | Coef.  | SE    | t     | P-value | [95% CI] | Coef.  | SE    | t     | P-value | [95% CI] |
|----------------------------------------------------|--------|-------|-------|---------|----------|--------|-------|-------|---------|----------|
| HSU values of the EQ-5D (Adjusted R²: 45%)          |        |       |       |         |          |        |       |       |         |          |
| Sex (Ref: Female)                                  | 0.024  | 0.022 | 1.090 | 0.276   | -0.019   | 0.068  | 0.013 | 0.009 | 1.420   | 0.155    | -0.005  | 0.031 |
| Age (in year)                                       | -0.001 | 0.001 | -1.980| 0.048   | -0.002   | 0.000  | 0.000 | 0.000 | -2.180  | 0.030    | -0.001  | 0.000 |
| Residence (Ref: Rural)                             | -0.003 | 0.022 | -0.120| 0.905   | -0.047   | 0.042  | -0.004| 0.009 | -0.390  | 0.695    | -0.022  | 0.014 |
| Hypertension (Ref: No)                             | -0.017 | 0.037 | -0.450| 0.652   | -0.089   | 0.056  | -0.015| 0.015 | -0.980  | 0.326    | -0.044  | 0.015 |
| Chronic cardiac diseases (Ref: No)                 | -0.032 | 0.049 | -0.660| 0.512   | -0.129   | 0.065  | -0.018| 0.020 | -0.900  | 0.371    | -0.058  | 0.022 |
| Chronic pulmonary disease (Ref: No)                | -0.018 | 0.042 | -0.420| 0.678   | -0.101   | 0.066  | -0.007| 0.017 | -0.400  | 0.689    | -0.041  | 0.027 |
| Asthma (Ref: No)                                    | -0.091 | 0.040 | -2.270| 0.024   | -0.169   | -0.012 | -0.036| 0.016 | -2.190  | 0.029    | -0.068  | -0.004 |
| Chronic kidney disease (Ref: No)                   | 0.022  | 0.083 | 0.270 | 0.788   | -0.140   | 0.185  | -0.003| 0.034 | -0.080  | 0.933    | -0.069  | 0.064 |
| Diabetes mellitus (Ref: No)                         | -0.008 | 0.031 | -0.270| 0.791   | -0.069   | 0.053  | -0.017| 0.013 | -1.310  | 0.192    | -0.041  | 0.008 |
| Malignance (Ref: No)                                | -0.009 | 0.066 | -0.140| 0.887   | -0.140   | 0.121  | -0.038| 0.027 | -1.420  | 0.158    | -0.092  | 0.015 |
| AIDS HIV (Ref: No)                                  | 0.039  | 0.090 | 0.440 | 0.664   | -0.137   | 0.215  | 0.030 | 0.037 | 0.830   | 0.409    | -0.042  | 0.103 |
| Dexamethasone use (Ref: No)                         | 0.089  | 0.029 | 3.110 | 0.002   | 0.033    | 0.145  | 0.026 | 0.012 | 2.240   | 0.026    | 0.003   | 0.049 |
| Internasal oxygen use (Ref: No)                    | -0.042 | 0.037 | -1.150| 0.251   | -0.114   | 0.030  | 0.012 | 0.015 | 0.810   | 0.421    | -0.017  | 0.042 |
| Health status on admission                          |        |       |       |         |          |        |       |       |         |          |        |       |
| Mild (Ref: No symptom)                              | -0.093 | 0.032 | -2.930| 0.004   | -0.156   | -0.031 | -0.064| 0.013 | -4.870  | 0.000    | -0.089  | -0.038 |
| Moderate (Ref: No symptom)                          | -0.269 | 0.037 | -7.360| 0.000   | -0.341   | -0.197 | -0.171| 0.015 | -11.450 | 0.000    | -0.200  | -0.142 |
| Sever (Ref: No symptom)                             | -0.445 | 0.047 | -9.520| 0.000   | -0.537   | -0.353 | -0.243| 0.019 | -12.720 | 0.000    | -0.281  | -0.206 |
| Length of stay (in days)                            | -0.001 | 0.002 | -0.300| 0.767   | -0.005   | 0.004  | -0.001| 0.001 | -1.180  | 0.237    | -0.003  | 0.001 |
| _cons                                              | 0.955  | 0.043 | 22.110| 0.000   | 0.870    | 1.039  | 0.847 | 0.018 | 47.940  | 0.000    | 0.812   | 0.881 |

*Coef*: Coefficient; *CI*: Confidence Interval; *SE*: Standard Error; *Ref*: Reference category.

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