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Evaluation of post COVID-19 conditions and functional disabilities: A cross-sectional survey

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ABSTRACT

Objective: To assess the prevalence of post COVID-19 conditions, functional disability impacting daily living, and associated socio-demographic determinants.

Methods: In this cross-sectional door-to-door survey, post COVID-19 conditions were identified. Functional impairment was assessed using EuroQoL five-dimension five-level (EQ-5D-5L) questionnaire. Relative risk of symptoms in the COVID-19 positive group as compared to the symptoms in the COVID-19 negative group was calculated. *Chi*-square test with subsequent Bonferroni's correction was performed to analyze the association of symptoms with age categories, sex and severity of infection. *P* value <0.05 was considered to be statistically significant.

Results: Out of 57 610 persons surveyed, COVID-19 test reports were available for 34 602 (1 799 positive and 32 803 negative) respondents. Post COVID-19 complaints were significantly more prevalent in infected individuals, including loss of taste (*RR* 8.82, 95% *CI* 4.77-16.31, *P*<0.01), loss of smell (*RR* 7.29, 95% *CI* 3.74-14.22, *P*<0.01), fatigue (*RR* 2.97, 95% *CI* 2.56-3.44, *P*<0.01), muscle pains (*RR* 1.86, 95% *CI* 1.59-2.18, *P*<0.01). EQ-5D-5L scores reflected greater difficulty in mobility, self-care, daily

Summary

Question: What is the post COVID-19 conditions, functional disabilities persisting in COVID-19 affected population, in Scheduled Caste-dominated villages?

Findings: In this cross-sectional door-to-door survey of 34 602 respondents, individuals who had tested COVID-19 positive reported significantly higher prevalence of loss of taste, loss of smell, fatigue, and muscle pain compared with non-infected individuals. Functional assessment using the EQ-5D-5L instrument also showed greater difficulty in mobility, self-care, usual activities, and mental health among the infected group.

Meaning: Post COVID-19 conditions are associated with substantial functional limitations in daily life, highlighting the need for long-term monitoring and targeted interventions to improve quality of life in affected populations.

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activities, and mental health among the infected group, especially in moderate to severe cases.

Conclusions: The survey highlights a significantly higher burden of post COVID-19 complaints and functional limitations among COVID-19 positive individuals. These findings underscore the necessity for long-term management strategies to mitigate the burden of post COVID-19 conditions and poor functional status.

KEYWORDS: Arsenic album; Cough; EQ-5D-5L questionnaire; Fatigue; Post COVID-19; Post COVID-19 functional status; Scheduled Castes

1. Introduction

With the sudden pandemic of COVID-19 caused by the SARS CoV-2, the initial public health responses were focused on reducing the acute burden of mortality and severity of infection. A significant proportion of COVID-19 survivors following the acute COVID-19 infection presented with long-term functional consequences, which lasted even for months. Such consequences following acute infection, lasting for three months and more, are referred to as "Long COVID" or "post COVID-19 syndrome"[1-3].

Post COVID-19 functional disability is defined as persistence of signs and symptoms and/or delayed or long-term complications beyond 4 weeks from the onset of symptoms; development of a new array of symptoms within a month after the initial cure or exaggeration of previously experienced chronic diseases within a month after initial recovery from COVID-19[4].

Post COVID-19 conditions symptoms vary from mild discomfort to severe effects on society and public health, which include physical, cognitive, and psychosocial well-being of the general population worldwide, with many patients in need of long-term follow-up, management, and support. The pathogenesis of post COVID-19 syndrome is multi-factorial, where prolonged inflammation is believed to be the key factor accounting for neurological and cognitive dysfunction and several other symptoms. The pathogenetic mechanisms suggested to be involved are immune-mediated vascular dysfunction, thromboembolism, and nervous system dysfunction[5]. The growing body of evidence shifts prime concern for healthcare systems towards these after effects resulting from SARS-CoV-2 infection *i.e.* longer-term physical and mental health consequences[6].

The most common sequelae of COVID-19 include fatigue or muscle weakness, headache, dyspnea, chest pain, myalgia, sleep difficulties, and anxiety or depression, including rare neurological and thromboembolic complications[5,7-12] affecting the quality of life. The incidence of post COVID-19 illness is estimated to be 10% to 35% in patients who did not require hospitalization, regardless of comorbidities[5,8,13,14], while it rates up to 80% among COVID-19 patients needing hospitalization and among patients who had a severe infection[5,15-17].

Post COVID-19 conditions and functional disabilities have drawn attention and are progressively recognized as a clinical entity in the context of SARS-CoV-2 infection calling for extensive research into the causes, risk factors, clinical features, diagnosis, management, and outcomes. It is essential to know the burden of post COVID-19 functional disabilities to identify the needs of affected individuals for proper planning and allocation of health resources. So, the Central Council for Research in Homoeopathy undertook the Public Health Initiative for identification of persons suffering from post COVID-19 conditions and functional disabilities in the population of pre-identified scheduled castes (SC) dominated areas. To our knowledge, this is the first community-based survey in India to identify the proportion of population suffering from various clinical conditions, subsequent to COVID-19 infection, identifying persistence or appearance of complaints which impact functioning and daily activities after a COVID-19 infection.

2. Methods

2.1. Study population

This was a cross-sectional, door-to-door population survey. The government undertakes special health promotion activities in SC dominated areas, considering these to be highly vulnerable and socially disadvantaged[18]. Under the SC sub plan, health care activities are undertaken by Central Council for Research in Homoeopathy. To identify the needs of this population, particularly immediately after the COVID-19 pandemic started to wane, 24 SC-dominated villages through 12 research institutes across the country under Central Council for Research in Homoeopathy (Supplementary Table 1) were identified, where this door to door survey was conducted. The survey was conducted over a period of 4 months, from July 2021 to October 2021, covering 551 957 population and 114 085 households. The study was approved by the Central Ethical Committee of Central Council for Research in Homoeopathy vide reference number 6-2/2020-21/CCRH/Tech./27"EC/9995 dated 4th February 2022 and was conducted in line with the ethical guidelines of the Declaration of Helsinki.

2.2. Study participants

Individuals more than 18 years of age, any sex, residing in the pre-identified areas, who can be interviewed directly and consented to participate in the survey were included. Voluntary written informed consent was obtained from all the participants. All participants who had suffered from COVID-19 like symptoms (*i.e.* fever for more

than 3 days or cough for more than 3 days, breathlessness for one day or more or sudden loss of smell), with either COVID-19 positive or negative test report with them anytime from the past 6 months to preceding 4 weeks were included. The participants who did not have the report available with them were excluded.

2.3. Questionnaire

Based on existing literature, a survey form was designed on Google forms. The questions were drafted in a simple, easy-to-understand format in English to be asked by the surveyor in English/local language. The Face validity of the questionnaire was examined by a group of homoeopathic researchers (with more than 10 years of experience in survey and population-based studies) and necessary modifications were made based on their feedback. The questionnaire was pilot tested on 20 participants from randomly chosen households near one study centre. The feedback was used to modify and refine the questionnaire.

2.4. Content of survey

The survey form comprised of 54 questions, divided into three parts. The first section included a brief of the survey objective and sought participant consent. The second section recorded participant's socio-demographic characteristics, *i.e.* age, sex, educational qualification, occupation and income status. It also included information regarding the intake of homoeopathic prophylactic 'Arsenic album 30' as immune booster against COVID-19[19], COVID-19 vaccination status of the participants, type of vaccine and number of doses taken was also recorded. The third section included questions on history of COVID-19 infection or fever and COVID-19 like symptoms and its impact on daily functioning and activities. The symptoms of patients were grouped system-wise as: general (fatigue or easy fatigability, myalgia, and loss of weight), respiratory (dyspnoea, chest pain, cough, and wheezing), neuropsychiatric (headache, brain fag, concentration or memory deficit, and mood changes as depression and anxiety), dermatologic (hair loss and rash), gastrointestinal (abdominal pain, diarrhea, and constipation), and weight loss. Comorbidities like hypertension, diabetes, cardiovascular disorders, joint pains, feeling of poor health, skin complaints *etc.* were assessed. We also evaluated the quality of life after recovery from COVID-19 by using the EuroQoL five dimension five level questionnaire (EQ-5D-5L). The EQ-5D-5L measures the QoL based on a five-component scale (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression[20]. Each component has five response levels: no problems (Level 1), slight problems (Level 2), moderate problems (Level 3), severe problems (Level 4), and extreme problems (Level 5).

2.5. Data collection

Homoeopathic graduate doctors (with about one year of experience) approached people for a one-time interaction. At the beginning, the participants were informed about the survey. The participants were informed that their anonymity and confidentiality would be honoured and identifying information about any person shall be coded and not disclosed at the time of publication or presentation of survey results. After the participant consent, questions were asked sequentially to complete the survey. Completed questionnaires were records which were checked, and data validation was conducted by the study coordinator.

2.6. Statistical analysis

Data of respondents with confirmed COVID-19 positive or negative status were included in the analysis, and their health complaints were compared. The data from respondents who were not sure of their COVID-19 status were excluded from analysis. Incomplete forms were also excluded.

The analysis was performed using IBM SPSS 20.0 software version. Descriptive data is presented as mean ± standard deviation (SD) for continuous variables and as frequency and percentages for categorical variables. Continuous variables were assessed for normality using Shapiro-Wilks test. Relative risk of symptoms such as fatigue, shortness of breath, *etc.* in the COVID-19 positive group as compared to the symptoms in the COVID-19 negative group was calculated. *Chi*-square test was performed to analyze the association of overall health status (symptoms *viz.* shortness of breath, cough, sore throat, chest congestion, headache, fever, fatigue, loss of taste, loss of smell, nausea and vomiting, diarrhoea, muscle pain, rashes and co-morbidities *viz.* body pains/joint pains, hypertension, weakness, respiratory weakness, diabetes mellitus, gastric complaints/ indigestion, brain fag/forgetfulness, feeling hopeless/depression/ unhappy mood, weight loss, feeling of poor health, skin complaints, cardiac complaints, weight gain) with different age categories, sex and severity of infection. Fisher's exact test was applied when expected cell counts were small, and Monte Carlo simulation was used to estimate *P*-values where required. *P* value <0.05 was considered to be statistically significant. For variables showing significant associations, pairwise comparisons were performed using Bonferroni correction with adjusted *P*-values. Quality of life was compared between the COVID-19 positive and COVID-19 negative groups. Also, quality of life in comparison to the severity of COVID-19 infection was analyzed using *Chi*-square test.

Quality of life was compared between the COVID-19 positive and COVID-19 negative groups, and among the COVID-19 positive group it was further analyzed according to the severity of infection. A *P*-value < 0.05 was considered statistically significant.

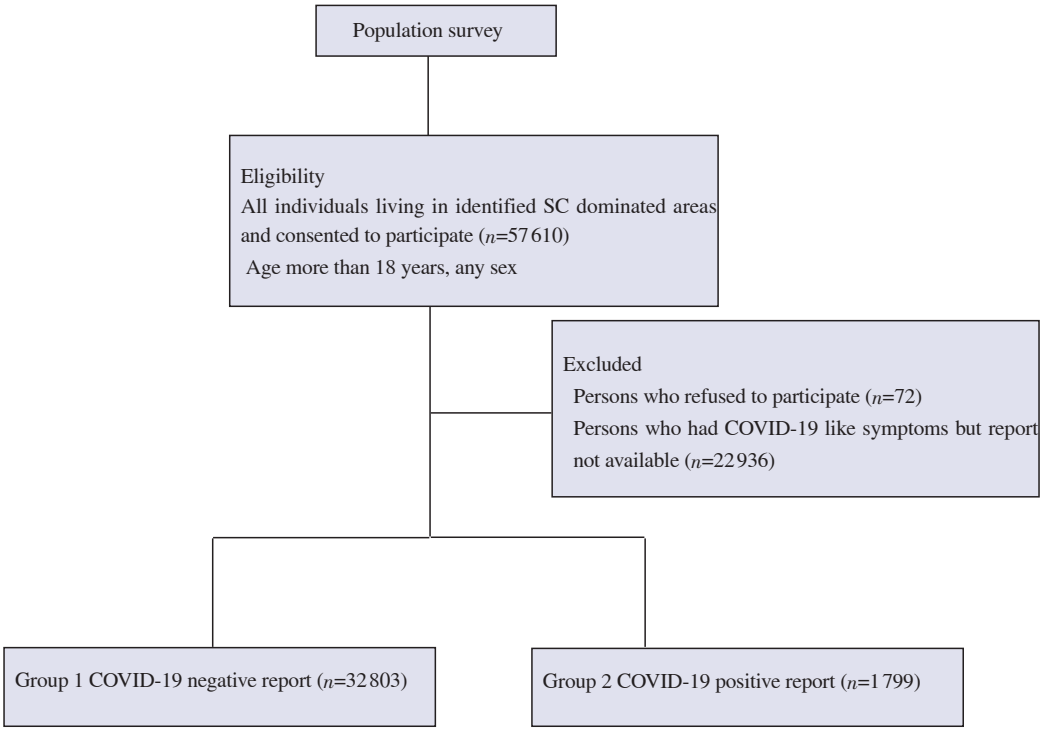

Figure 1. Flow chart for the inclusion of study participants between July-October 2021. SC: Scheduled Castes.

3. Results

A total of 57610 persons were approached for survey (Figure 1). Seventy-two (72) individuals declined to participate in the study. Out of these, 34602 respondents had a COVID-19 test reports whose data was included in the analysis. One thousand seven hundred and ninety-nine (1799) individuals reported having tested COVID-19 positive and 32803 reported COVID-19 negative test results. Remaining, 22936 individuals reported suffering from symptoms such as cough, fever, *etc.* in the past but did not have test reports confirming COVID-19 status.

3.1. Socio–demographic profile

The socio-demographic profile of participants is presented in Table 1. The mean age of study sample was (38.87±15.04) years (range: 18-80 years) where 13% were 60 years and older. Of the participants 50.62% were male and 49.34% females. 45.38% were unemployed and 72.38% had monthly income below eleven thousand Rupees. 76.21% were vaccinated (64% had Covishield® from Serum Institute of India Pvt. Ltd.; Covaxin® from Bharat Biotech International Limited). 53.86% reported to have used the homoeopathic prophylactic "Arsenicum album 30" as recommended by the Ministry of Ayush. The mean time since COVID-19 infection, till the date of recording of symptoms was (5.01±2.33) months.

3.2. Post COVID–19 complaints

The most common post COVID-19 symptoms in COVID-19 positive group were fatigue (10.45%), muscle pain (8.89%), headache (3.39%), shortness of breath (2.61%) and cough (2.45%). In contrast, participants with negative COVID-19 report also reported to have symptoms like muscle and joint aches (4.77%), headache (4.35%), fatigue (3.52%), cough (2.66%), vomiting (2.21%), shortness of breath (2.12%), during the preceding 6 months (Table 2).

The relative risk of symptoms like fatigue (*RR* 2.97, 95% *CI* 2.56-3.44, *P*<0.01), chest congestion (*RR* 1.29, 95% *CI* 0.88-1.88, *P*=0.19), shortness of breath (*RR* 1.23, 95% *CI* 0.92-1.65, *P*=0.16), loss of taste (*RR* 8.82, 95% *CI* 4.77-16.31, *P*<0.01), loss of smell (*RR* 7.29, 95% *CI* 3.74-14.22, *P*<0.01), muscle pains (*RR* 1.86, 95% *CI* 1.59-2.18, *P*<0.01), rashes (*RR* 1.44, 95% *CI* 0.80-2.59, *P*=0.22), was significantly higher in COVID-19 positive group as compared to COVID-19 negative participants (Table 2). Thus, this study revealed that the COVID-19 positive patients were more susceptible to develop these presenting features well known as post COVID-19 syndrome in comparison to COVID-19 negative population.

The associated comorbidities like depression, sadness and unhappy mood (*RR* 6.34 , 95% *CI* 5.18-7.77, *P*<0.01), weakness (*RR* 3.73, 95% *CI* 3.34-4.17, *P*<0.01), cardiac complaints (*RR* 3.33, 95% *CI* 1.99-5.58, *P*<0.01), hypertension (*RR* 2.39, 95% *CI* 2.14-2.66, *P*<0.01), joint pains (*RR* 2.18, 95% *CI* 1.99-2.40, *P*<0.01), skin

complaints (*RR* 1.93, 95% *CI* 1.37-2.72, *P*<0.01), weight loss (*RR* 1.76, 95% *CI* 1.19-2.60, *P*<0.01), gastric complaints/ indigestion (*RR* 1.46, 95% *CI* 1.26-1.69, *P*<0.01), diabetes (*RR* 1.28, 95% *CI* 1.08-1.52, *P*=0.01), feeling of poor health (*RR* 7.26, 95% *CI* 6.30-8.38, *P*<0.01), were also significantly higher in COVID-19 positive patients (Table 2).

Analysis of the COVID-19 positive group was done to evaluate the persistence of complaints 4 weeks after recovery from the acute

Table 1. Socio-demographical characteristics of survey participants.

Variables	Total population (*n*=34 602)	Group 1[a] (*n*=32 803)	Group 2[b] (*n*=1 799)
Age, years, mean±SD	38.87±15.04	38.71±14.99	41.81±15.57
Sex, *n* (%)			
Male	17 516 (50.62)	16 608 (50.63)	908 (50.47)
Female	17 074 (49.34)	16 183 (49.33)	891 (49.53)
Transgender	12 (0.03)	12 (0.04)	0 (0.00)
Education, *n* (%)			
Illiterate	7 489 (23.57)	7 250 (23.97)	239 (15.66)
Up to 10th grade	17 037 (53.61)	16 444 (54.36)	593 (38.86)
Graduate	5 985 (18.83)	5 323 (17.60)	662 (43.38)
Post graduate	1 266 (3.98)	1 234 (4.08)	32 (2.10)
No response	2 825 (8.16)	2 552 (7.78)	273 (15.17)
Occupation, *n* (%)			
Unemployed	14 243 (45.38)	13 574 (45.43)	669 (44.30)
Self employed	10 836 (34.52)	10 439 (34.94)	397 (26.29)
Salaried	6 307 (20.09)	5 863 (19.62)	444 (29.40)
No response	3 216 (9.29)	2 927 (8.92)	289 (16.06)
Monthly income (in Rupees, per month), *n* (%)			
Below 11 000	21 165 (72.38)	20 266 (72.83)	899 (63.44)
11 000- 20 000	5 715 (19.54)	5 362 (19.27)	353 (24.91)
More than 20 000	2 363 (8.08)	2 198 (7.90)	165 (11.64)
No response	5 359 (15.49)	4 977 (15.17)	382 (21.23)
Vaccination, *n* (%)	26 312 (76.21)	25 367 (77.52)	945 (52.53)
Arsenic album 30, *n* (%)	18 636 (53.86)	17 888 (54.53)	748 (41.58)

[a]Group 1: Individuals with COVID-19 like symptoms with negative report; [b]Group 2: Individuals with COVID-19 with positive report available with them.

Table 2. Spectrum of post COVID-19 symptoms and associated comorbidities of the study participants [*n* (%)].

Variables	Total population (*n*=34 602)	Group 1[a] (*n*=32 803)	Group 2[b] (*n*=1 799)	*P* value[*]	*RR* (95% *CI*)
Symptoms					
Shortness of breath	744 (2.15)	697 (2.12)	47 (2.61)	0.16	1.23 (0.92-1.65)
Cough	917 (2.65)	873 (2.66)	44 (2.45)	0.58	0.92 (0.68-1.24)
Sore throat	361 (1.04)	351 (1.07)	10 (0.56)	0.04	0.52 (0.28-0.97)
Chest congestion	424 (1.23)	396 (1.21)	28 (1.56)	0.19	1.29 (0.88-1.88)
Headache	1 489 (4.30)	1 428 (4.35)	61 (3.39)	0.05	0.78 (0.61-1.00)
Fever	324 (0.94)	319 (0.97)	5 (0.28)	<0.01	0.29 (0.12-0.69)
Fatigue	1 343 (3.88)	1 155 (3.52)	188 (10.45)	<0.01	2.97 (2.56-3.44)
Loss of taste	46 (0.13)	31 (0.09)	15 (0.83)	<0.01	8.82 (4.77-16.31)
Loss of smell	42 (0.12)	30 (0.09)	12 (0.67)	<0.01	7.29 (3.74-14.22)
Nausea and vomiting	738 (2.13)	724 (2.21)	14 (0.78)	<0.01	0.35 (0.20-0.60)
Diarrhoea	316 (0.91)	300 (0.91)	16 (0.89)	0.91	0.97 (0.59-1.60)
Muscle pain	1 726 (4.99)	1 566 (4.77)	160 (8.89)	<0.01	1.86 (1.59-2.18)
Rashes	164 (0.47)	152 (0.46)	12 (0.67)	0.22	1.44 (0.80-2.59)
Comorbidities/Overall health status					
Body pains/joint pains	3 533 (10.21)	3 155 (9.62)	378 (21.01)	<0.01	2.18 (1.99-2.40)
Hypertension	2 711 (7.83)	2 397 (7.31)	314 (17.45)	<0.01	2.39 (2.14-2.66)
Weakness	1 861 (5.38)	1 545 (4.71)	316 (17.57)	<0.01	3.73 (3.34-4.17)
Respiratory weakness	445 (1.29)	342 (1.04)	103 (5.73)	0.15	0.73 (0.47-1.12)
Diabetes mellitus	1 935 (5.59)	1 808 (5.51)	127 (7.06)	0.01	1.28 (1.08-1.52)
Gastric complaints/Indigestion	2 341 (6.77)	2 168 (6.61)	173 (9.62)	<0.01	1.46 (1.26-1.69)
Brain fag/forgetfulness	548 (1.58)	527 (1.61)	21 (1.17)	0.15	0.73 (0.47-1.12)
Feeling hopeless/depression/Unhappy mood	461 (1.33)	342 (1.04)	119 (6.61)	<0.01	6.34 (5.18-7.77)
Weight loss	307 (0.89)	280 (0.85)	27 (1.50)	<0.01	1.76 (1.19-2.60)
Feeling of poor health	832 (2.40)	595 (1.81)	237 (13.17)	<0.01	7.26 (6.3-8.38)
Skin complaints	366 (1.06)	331 (1.01)	35 (1.95)	<0.01	1.93 (1.37-2.72)
Cardiac complaints	110 (0.32)	93 (0.28)	17 (0.94)	<0.01	3.33 (1.99-5.58)

RR, Relative risk; *CI*, confidence interval; Group 1: Participants developed COVID-19 like symptoms but had negative reports; Group 2: Participants infected with COVID-19 with positive reports available with them; [*]*Chi*-square test.

phase of COVID-19. The symptoms varied widely; some patients had overlapping symptoms between COVID-19 and post COVID-19 syndrome (Figure 2). Fatigue (10.45%) emerged as the most common symptom, followed by muscle and joints pain, headache, shortness of breath, cough, chest congestion, diarrhoea, loss of taste, nausea and vomiting, loss of smell, rashes, sore throat and fever in post COVID-19 phase. These results highlight the complex nature of recovery, with many patients still experiencing lingering symptoms despite clinical improvement, indicating the long-term impact of COVID-19 and the potential for post COVID-19 functional disabilities.

Age and sex as determinants of post COVID-19 complaints was tested in the COVID-19 positive group. Difference between male and female participants was not statistically significant except for indigestion which was more frequently observed in males as compared to females (P=0.002). Individuals aged 41–60 years who contracted COVID-19 exhibited a significantly higher prevalence of muscle pain (P<0.001), while a feeling of poor health was more commonly reported among individuals aged more than 60 years. Additionally, body pain, joint pain, hypertension, and diabetes mellitus were observed significantly more frequently (P<0.001) in both the 41-60-year and >60-year age groups compared to the 18–40-year age group (Table 3).

The clinical course of COVID-19 was classified into four groups *viz.* asymptomatic, mild, and moderate and severe according to the intensity or severity of the symptoms. Respondents who had not exhibited any symptoms, but their COVID-19 report was positive were referred as asymptomatic (52/1 799, 2.89%), those had symptoms managed easily at home (1 476/1 799, 82.05%) were regarded as having mild symptoms, those who received oxygen therapy (68/1 799, 3.78%) had moderate clinical course. In 203 participants (11.28%), the clinical course could not be ascertained. None of the enrolled participants reported admission in an intensive care unit (ICU) or had severe COVID-19 infection.

A statistically significant (P<0.05) relation was observed between the severity of COVID-19 with post COVID-19 manifestations (shortness of breath, cough, chest congestion, headache, fatigue, loss of taste, loss of smell, nausea and vomiting, diarrhoea, muscle or joints pain and rashes) and co-morbidities (body pains/joint pains, hypertension, weakness, respiratory weakness, diabetes mellitus, gastric complaints/indigestion, brain fag/forgetfulness, depression, weight loss, feeling of poor health, skin complaints, cardiac complaints), as demonstrated in Table 4.

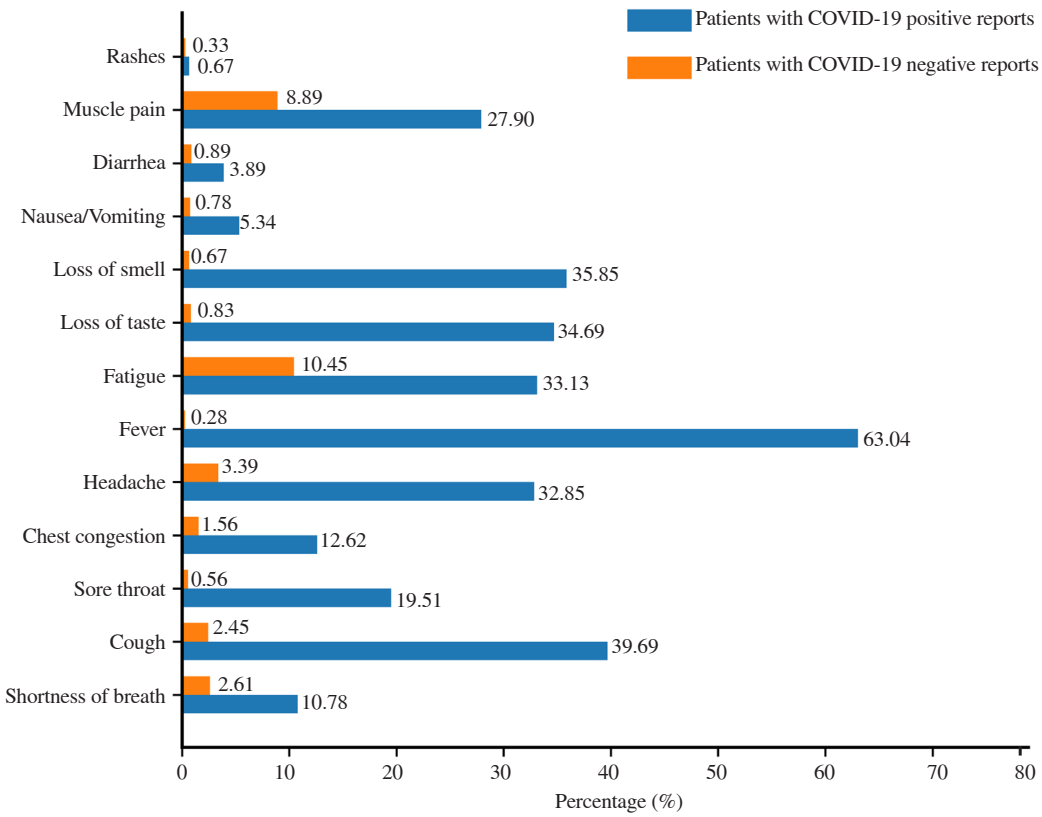

Figure 2. Comparison of COVID-19 and post COVID-19 manifestations.

Table 3. Age and sex variables with post COVID-19 manifestations and comorbidities (n=1 799) [n (%)].

Variables	Age group			P-value*	Sex		P-value[a]
	18-40 years (n=904)	41-60 years (n=677)	> 60 years (n=218)		Male (n=908)	Female (n=891)	
Shortness of breath	20 (2.21)	20 (2.95)	7 (3.21)	0.553	18 (1.98)	29 (3.25)	0.091
Cough	22(2.43)	15 (2.21)	7 (3.21)	0.710	21 (2.31)	23 (2.58)	0.712
Sore throat	7 (0.77)	2 (0.29)	1 (0.46)	0.439	5 (0.55)	5 (0.56)	>0.05[b]
Chest congestion	19 (2.10)	6 (0.89)	3 (1.38)	0.151	15 (1.65)	13 (1.46)	0.741
Headache	32 (3.54)	24 (3.54)	5 (2.29)	0.634	29 (3.19)	32 (3.59)	0.641
Fever	1 (0.11)	4 (0.59)	0 (0.00)	0.141	2 (0.22)	3 (0.34)	0.684[b]
Fatigue	84 (9.29)	89 (13.15)	15 (6.88)	0.009	85 (9.36)	103 (11.56)	0.127
Loss of taste	9 (0.99)	5 (0.74)	1 (0.46)	0.694	7 (0.77)	8 (0.90)	0.767
Loss of smell	6 (0.66)	5 (0.74)	1 (0.46)	0.907	6 (0.66)	6 (0.67)	0.974
Nausea and vomiting	8 (0.88)	5 (0.74)	1 (0.46)	0.804	5 (0.55)	9 (1.01)	0.268
Diarrhoea	9 (0.99)	5 (0.74)	2 (0.92)	0.864	9 (0.99)	7 (0.78)	0.642
Muscle pain	59 (6.53)	84 (12.41)*	17 (7.80)	<0.001	80 (8.81)	80 (8.98)	0.900
Rashes	6 (0.66)	5 (0.74)	1 (0.46)	0.907	6 (0.66)	6 (0.67)	0.974
Comorbidities/Overall health status							
Body pains/joint pains	141(15.60)	167 (24.67)*	70 (32.11)*	<0.001	175 (19.27)	203 (22.78)	0.68
Hypertension	86 (9.51)	153 (22.60)*	75 (34.40)*#	<0.001	165 (18.17)	149 (16.72)	0.418
Weakness	154 (17.03)	124 (18.32)	38 (17.43)	0.802	150 (16.52)	166 (18.63)	0.239
Respiratory weakness	42 (4.65)	44 (6.50)	17 (7.80)	0.109	48 (5.29)	55 (6.17)	0.418
Diabetes mellitus	17 (1.88)	83 (12.26)*	27 (12.38)*	<0.001	65 (7.16)	62 (6.96)	0.868
Gastric complaints/Indigestion	86 (9.51)	69 (10.19)	18 (8.26)	0.693	107 (11.78)	66 (7.41)	0.002
Brain fag forgetfulness	7 (0.77)	10 (1.48)	4 (1.83)	0.270	13 (1.43)	8 (0.90)	0.292
Feeling hopeless/depression/ Unhappy mood	57 (6.30)	52 (7.68)	10 (4.59)	0.242	67 (7.38)	52 (5.84)	0.188
Weight loss	10 (1.11)	11 (1.62)	6 (2.75)	0.189	14 (1.54)	13 (1.46)	0.885
Feeling of poor health	101 (11.17)	94 (13.88)	42 (19.27)*	0.005	115 (12.66)	122 (13.69)	0.519
Skin complaints	19 (2.10)	15 (2.21)	1 (0.46)	0.234	23 (2.53)	12 (1.35)	0.069
Cardiac complaints	5 (0.55)	10 (1.48)	2 (0.92)	0.171	11 (1.21)	6 (0.67)	0.238

[a]Standard *Chi*-square test; [b]Fisher exact test; P<0.05 is considered significant; Bonferroni-adjusted pairwise comparisons of age groups: *P<0.05 comparing with 18-40 years group; #P<0.05 comparing with 41-60 years group.

Table 4. Severity of COVID-19 with post COVID-19 manifestations and comorbidities (n=1 596) [n (%)].

Post COVID-19 manifestations	Severity of COVID-19 infection			P-value*
	Asymptomatic (n=52)	Mild (n=1 476) (managed easily at home)	Moderate (n=68) (only oxygen therapy used)	
Symptoms				
Shortness of breath	0 (0.0)	28 (1.9)	13 (19.1)	<0.01
Cough	0 (0.0)	30 (2.0)	9 (13.2)	<0.01
Sore throat	0 (0.0)	5 (0.3)	1 (1.5)	0.053
Chest congestion	1 (1.9)	20 (1.3)	3 (4.4)	<0.01
Headache	0 (0.0)	48 (3.2)	9 (13.2)	<0.01
Fever	0 (0.0)	1 (0.1)	1 (1.5)	>0.05
Fatigue	2 (3.8)	163 (11.0)	18 (26.5)	<0.01
Loss of taste	0 (0.0)	10 (0.7)	1 (1.5)	<0.01
Loss of smell	0 (0.0)	7 (0.5)	0 (0.0)	0.001
Nausea and vomiting	0 (0.0)	10 (0.7)	1 (1.5)	<0.01
Diarrhoea	0 (0.0)	8 (0.5)	3 (4.4)	0.01
Muscle or joints pain	4 (7.7)	134 (9.1)	19 (27.9)	<0.01
Rashes	0 (0.0)	6 (0.4)	1 (1.5)	0.02
Comorbidities				
Body pains/joint pains, n (%)	11 (21.1)	327 (22.1)	35 (51.5)	<0.01[a]
Hypertension, n (%)	13 (25.0)	264 (17.9)	30 (44.1)	<0.01[a]
Weakness, n (%)	9 (17.3)	267 (18.1)	35 (51.5)	<0.01[a]
Respiratory weakness, n (%)	1 (1.9)	73 (4.9)	24 (35.3)	<0.01
Diabetes mellitus, n (%)	2 (3.8)	105 (7.1)	15 (22.0)	<0.01
Gastric complaints/Indigestion, n (%)	2 (3.8)	148 (10.0)	17 (25.0)	<0.01
Brain fag forgetfulness, n (%)	0 (0.0)	11 (0.7)	5 (7.3)	0.003
Feeling hopeless/ depression/Unhappy mood, n (%)	4 (7.7)	98 (6.6)	11 (16.2)	<0.01
Weight loss, n (%)	0 (0.0)	15 (1.0)	7 (10.3)	<0.01
Feeling of poor health, n (%)	8 (15.4)	203 (13.7)	19 (27.9)	<0.01[a]
Skin complaints, n (%)	0 (0.0)	25 (1.7)	5 (22.0)	<0.01
Cardiac complaints, n (%)	1 (1.9)	8 (0.5)	3 (4.4)	0.049

*Chi-square test with Monte Carlo simulation (used when expected counts <5); [a]Standard Chi-square test; P value <0.05 is considered to be statistically significant.

3.3. Post COVID–19 functional disability status

EuroQoL five dimension five level questionnaire (EQ-5D-5L) was used to assess the functional disability status impacting quality of life of the respondents. Prevalence of slight and moderate problems while walking, washing or dressing, doing usual activity were significantly higher in COVID-19 positive patients than in COVID-19 negative participants. Pain or discomfort was also significant more commonly found in COVID-19 positive participants than in COVID-19 negative participants. COVID-19 positive participants were found to be more anxious and depressed as compared to COVID-19 negative participants (Table 5).

Pain, usual activities of daily living and mental status differed significantly in persons who reported to have suffered from a moderately severe infection as compared to those who had mildly symptomatic course (Table 6).

4. Discussion

Out of 57 610 participants, 60.06% had documented COVID-19 test reports available. Although several other participants reported COVID-19–like symptoms, only individuals with confirmed test reports were included in the analysis to ensure diagnostic certainty. Neuropsychiatric manifestations including fatigue, depression, anxiety, and cognitive impairments, are widely recognized sequelae of post-acute COVID-19 syndrome, with substantial adverse effects on functional capacity and overall quality of life[21-24]. In the present study, fatigue emerged as the most severe as well as the most commonly occurring post COVID-19 complaint with a *RR* of 2.97 (95% *CI* 2.56-3.44, *P*<0.01), as compared to the population not affected from COVID-19 infection. Where 33.1% participants reported fatigue during COVID-19 infection, the complaint persisted in 10.45% and was reported in only 3.52% of those not affected by COVID-19. Also, feeling of weakness, poor health, feeling of

Table 5. Post COVID-19 functional disability status of the study participants [*n* (%)].

Quality of Life	Total population (*n*= 34 602)	Group 1 (*n*= 32 803)	Group 2 (*n*=1 799)	*P*-value[a]
Walking about				
I am unable to do	3 (0.01)	2 (0.01)	1 (0.06)	<0.01
I have severe problem	321 (0.93)	306 (0.93)	15 (0.93)	
I have moderate problems	1 338 (3.89)	1 256 (3.83)	82 (5.06)	
I have slight problems	3 715 (10.79)	3 380 (10.30)	335 (20.68)	
I have no problems	29 046 (84.38)	27 859 (84.93)	1 187 (73.27)	
Washing or dressing myself				
I am unable to do	2 (0.01)	1 (0.06)	1 (0.06)	<0.01
I have severe problem	288 (0.84)	275 (0.84)	13 (0.80)	
I have moderate problems	1 125 (3.27)	1 039 (3.17)	86 (5.32)	
I have slight problems	3 332 (9.68)	3 112 (9.49)	220 (13.61)	
I have no problems	29 672 (86.21)	28 376 (86.50)	1 296 (80.20)	
Doing my usual activities				
I am unable to do	7 (0.02)	4 (0.01)	3 (0.19)	<0.01
I have severe problem	428 (1.24)	398 (1.21)	30 (1.86)	
I have moderate problems	1 201 (3.49)	1 095 (3.34)	106 (6.56)	
I have slight problems	3 066 (8.91)	2 774 (8.46)	292 (18.06)	
I have no problems	29 718 (86.34)	28 532 (86.98)	1 186 (73.35)	
Pain or discomfort				
I am unable to do	39 (0.11)	30 (0.09)	9 (0.56)	<0.01
I have severe problem	692 (2.1)	651 (1.98)	41 (2.54)	
I have moderate problems	1 272 (3.70)	1 130 (3.44)	142 (8.78)	
I have slight problems	5 027 (14.60)	4 752 (14.49)	275 (17.01)	
I have no problems	27 390 (79.58)	26 240 (79.99)	1 150 (71.12)	
Anxious or depressed				
I am unable to do	13 (0.04)	4 (0.01)	9 (0.56)	<0.01
I have severe problem	137 (0.40)	111 (0.34)	26 (1.61)	
I have moderate problems	477 (1.39)	414 (1.26)	63 (3.89)	
I have slight problems	1 799 (5.23)	1 574 (4.80)	225 (13.91)	
I have no problems	31 995 (92.95)	30 700 (93.59)	1 295 (80.04)	

Group 1: Participants developed COVID-19 like symptoms with negative reports, Group 2: Participants infected with COVID-19 with positive reports available with them. [a]*Chi*-square test with Monte Carlo simulation (used when expected counts <5); *P* value <0.05 is considered to be statistically significant.

Table 6. Post COVID-19 functional disabilities and severity of COVID-19 of the study participants (n=1 596) [n (%)].

Quality of life	Clinical course of COVID-19			P-value[a]
	Asymptomatic (n=52)	Mild (n=1 476)	Moderate (n=68)	
Walking about				
I am unable to do	0 (0.0)	1 (0.07)	0 (0.0)	0.093
I have severe problem	1(1.92)	11 (0.74)	0 (0.0)	
I have moderate problems	2 (3.85)	70 (4.74)	6 (8.82)	
I have slight problems	11 (21.15)	282 (19.10)	21 (30.88)	
I have no problems	28 (53.85)	1 083 (73.37)*	32 (47.05)#	
Washing or dressing myself				
I am unable to do	0 (0.0)	1 (0.07)	0 (0.0)	0.085
I have severe problem	1 (1.92)	8 (0.54)	2 (2.94)	
I have moderate problems	4 (7.69)	73 (4.94)	8 (11.76)	
I have slight problems	6 (11.54)	191 (12.94)	13 (19.12)	
I have no problems	31 (59.61)	1 166 (78.99)*	44 (64.70)#	
Doing my usual activities				
I am unable to do	0 (0.0)	2 (0.13)	0 (0.0)	0.011
I have severe problem	1 (1.92)	25 (1.69)	3 (4.41)	
I have moderate problems	3 (5.77)	90 (6.09)	11 (16.18)#	
I have slight problems	10 (19.23)	246 (16.67)	21 (30.88)#	
I have no problems	28 (53.85)	1 076 (72.90)*	32 (47.05)#	
Pain or discomfort				
I am unable to do	0 (0.0)	6 (0.41)	2 (2.94)	0.006
I have severe problem	1 (1.92)	33 (2.23)	5 (7.35)	
I have moderate problems	4 (7.69)	126 (8.54)	9 (13.23)	
I have slight problems	5 (9.61)	231 (15.65)	18 (26.47)	
I have no problems	32 (61.54)	1 043 (70.66)	33 (48.53)#	
Anxious or depressed				
I am unable to do	0 (0.0)	9 (0.61)	5 (7.35)#	<0.001
I have severe problem	1 (1.92)	31 (2.10)	2 (2.94)	
I have moderate problems	3 (5.77)	51 (3.45)	11 (16.18)#	
I have slight problems	4 (7.69)	200 (13.55)	14 (20.59)	
I have no problems	34 (65.38)	1 192 (80.76)*	39 (57.35)#	

[a]*Chi*-square test with Monte Carlo simulation (used when expected counts <5); P value <0.05 is considered to be statistically significant. Bonferroni-adjusted pairwise comparisons of severity groups (asymptomatic, mild, and moderate); *P<0.05 comparing with asymptomatic group; #P<0.05 comparing with mild group.

hopelessness and unhappy mood were found to be significantly more common in the COVID-19 affected group rather than the negative group. Existing literature consistently identify fatigue as one of the most common symptoms of post COVID-19 infection[21-24]. Other than fatigue, joint pains (14%), respiratory problems (12%), hypertension (9%), gastric issues (7.9%), and depression (2.2%) emerged as a new onset complaints following COVID-19 infection.

Previous studies have reported a higher prevalence of post COVID-19 fatigue among females and younger individuals[24-30]. However, in contrast to these findings, the present study demonstrated a greater impact among the elderly population[24,26,27]. Furthermore, sex did not appear to significantly modify most post COVID-19 outcomes in this cohort, with the exception of indigestion, which was reported more frequently in males than in females.

Functional limitations related to walking, washing, dressing, and performing usual activities were significantly more prevalent in COVID-19 positive patients compared to COVID-19 negative participants. Furthermore, pain, discomfort, and anxiety/depression impacting daily living were significantly more pronounced in COVID-19 positive patients. Considering that the SC population is the most vulnerable group economically and socially, the impact of persistent fatigue on the disability level as well as the productivity and economic activity needs to be further examined. Also, the complaint does not usually have a standard treatment available, thereby increasing the scope of alternative medicines for treatment.

Out of 277 participants, 32.5% (90) participants reported a single post COVID-19 illness as compared to 67.5% (187) participants who reported two or more complaints persisting. None of the participants reported severe COVID-19 infection requiring hospitalization under intensive care. However, those with moderately severe COVID-19 infection requiring oxygen therapy reported persistence of complaints or newly developed complaints more frequently than those with mild or asymptomatic COVID-19 infection. The participants in the age group 41 to 60 years and above the age of 60 years, reported higher prevalence of body and joint pains, hypertension and diabetes mellitus.

The pandemic not only has caused mortality, the long-term morbidity and the associated impact of it needs to be explored further, taking into consideration the economically disadvantaged

populations. Treatment and rehabilitation strategies therefore are needed to be focused not only against specific conditions such as reported hypertension, diabetes and cardiac conditions, but against non-specific seemingly vague illnesses such as fatigue, feeling of weakness and unhappy mood, without being severe enough to be classified as clinical depression.

The Ministry of Ayush advocated use of a monthly dose of homoeopathic medicine 'Arsenic album 30' as a possible preventive against COVID-19 infection[31]. The medicine was reportedly used by almost 50% of the population in early phase of the pandemic as a protective in 2020 and 2021. The efficacy of Arsenic album 30 as a COVID-19 protective is reported[32,33]. Vaccination was introduced in February 2021 in the country and by the time the survey was undertaken almost 75% population had been vaccinated. The prevention strategies were not identified to specifically affect the post COVID-19 status or persistence of post COVID-19 complaints, at least in this study.

A limitation of this study is that reports of laboratories citing COVID-19 positive or negative status is taken as it is irrespective of the type of test conducted. The sensitivity and specificity of these tests and therefore confirmation of COVID-19 infection may affect the study results. However, since these were the tests used all over the country, on the basis of prevalence and treatment of COVID-19 and post COVID-19 sequalae and conditions have been undertaken and reported, the same is followed in this public health assessment survey.

Due to the scarcity and high degree of heterogeneity of existing research studies, the definition may change concerning the emergence of new evidence. The diversity in diagnostic criteria, methodology, and measured outcomes attributed to post COVID-19 condition becomes challenging and may slow down the progress towards terminology harmonization and a consensus-based classification of post COVID-19 syndrome is essential for diagnostic as well as therapeutic management.

Though most of the conditions were identified to be non-serious in nature, and not requiring intensive hospitalization, it is desirable that the conditions are treated at the doorstep of the patients to avoid further disability and loss of working days.

In the light of emerging epidemics and changing infections, it is imperative to study the current situation, as per the needs of the time to provide effective treatment solutions to minimize the impact of infections. The healthcare services need to be planned to cater to immediate needs at no additional costs for complaints affecting quality of life and yet not being serious enough to warrant hospitalizations or loss of working days in health care facility visits.

In clonclusion, the survey findings indicate a higher prevalence of post COVID-19 complaints in COVID-19 positive individuals compared to COVID-19 negative. The findings highlighted the necessity for long-term management strategies to mitigate the burden of post COVID-19 conditions and functional limitations emerging during the post COVID-19 period. The survey acts as a precursor for undertaking specific interventions targeting post COVID-19 complaints and functional disabilities and evaluating their effectiveness.

Conflict of interest statement

The authors declare no conflict of interest.

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Authors' contributions

RM conceptualized and designed the study, coordinated the implementation, performed data analysis and interpretation, and critically revised the manuscript for important intellectual content. SS compiled and validated the data, prepared the study master chart, contributed to data analysis and drafted the manuscript. GC, LN, BB, GRCR, DK, AM, RB, MS, AKP, KV, and RKS contributed to data acquisition and gave inputs to the manuscript development. NB contributed to data validation and conducted the data analysis. DT contributed to study design, questionnaire development, data analysis planning, manuscript drafting and critically revised the manuscript for important intellectual content. SK provided approvals for study implementation, critically revised the manuscript for important intellectual content. All authors gave approval to the final version for

submission. SCSP Study group are the research fellows and office assistants recruited for the study, who played a pivotal role in data collection and compilation.

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Supplementary Table 1. Population in post COVID-19 SCSP project.

State	Institute	Name of the areas covered	Total population	Number of Households	% of SC population
West Bengal	Dr Anjali Chatterjee Regional Research Institute for Homoeopathy, Kolkata, India	Surjyapur	5714	1362	44.21
		Jaypur Bil-Anandanagar	9598	2394	47.02
West Bengal	Regional Research Institute for Homoeopathy, Siliguri, India	Matigara Gram Panchayat	60000	13000	60.00
		Shivmandir, Atharokhai Gram Panchayat	30000	7000	55.00
Tripura	Regional Research Institute for Homoeopathy, Agartala, India	S.N. Colony and Purba Barjala	6959	1767	50.00
		Jirania Nagar Panchayat	7500	1500	40.00
Odisha	Drug Proving Unit, Bhubaneswar, India	Umadei Brahmapur	6000	1500	37.00
		Pratapsasan	15000	2500	30.00
Uttar Pradesh	Dr D P Rastogi Central Research Institute for Homoeopathy, Noida, India	Dhoom Manikpur	14000	2000	23.00
		Chipyana Buzurg	17400	5000	24.00
Maharashtra	Regional Research Institute for Homoeopathy, Mumbai, India	Ghatkopar (Shrimati Ramabai Nagar, Gurudwara etc)	76320	14482	66.82
		Chembur	16040	3820	40.00
Rajasthan	Central Research Institute for Homoeopathy, Jaipur, India	Chandlai	6961	1108	38.93
		Jaisinghpura	3998	690	36.22
Kerala	National Homoeopathic	Kurichi (Manimala)	21053	878	16.00

	Research Institute for Mental Health, Kottayam, India	Panachikkad	42071	417	4.11
Andhra Pradesh	Clinical Research Unit for Homoeopathy, Tirupati, India	Renigunta	75789	19339	29.00
		Chandragiri Rural	41372	10866	27.00
Tamilnadu	Homoeopathic Research Institute for Disabilities, Chennai, India	Kelambakkam	5189	1288	70.00
		Kovalam	8124	1974	70.00
Union Territory	Clinical Research Unit for Homoeopathy, Puducherry, India	Moolakulam	32489	8142	42.70
		Nellithope	44518	11027	40.00
Andhra Pradesh	Regional Research Institute for Homoeopathy, Gudivada, India	BC Hostel, Nagavarappadu	3362	1147	46.70
		BC Hostel, Bapuji Nagar	2500	884	80.00
	Total		**551957**	**114085**	