BMC Primary Care

RESEARCH

Open Access

# Insights into the morbidity profiles of epidemiologically excluded COVID-19 patients in primary care settings during the third wave of the pandemic in the Anuradhapura District, Sri Lanka

Parami Abeyrathna[1*], Suneth Buddhika Agampodi[2], Shyamalee Samaranayake[3] and Pahala Hangidi Gedara Janaka Pushpakumara[1]

## Abstract

**Background** The COVID-19 pandemic has dramatically impacted healthcare systems worldwide, leading to changes in the delivery of healthcare services. A profound effect on the well-being of non-COVID-19 patients has been reported, but limited evidence is available from developing countries. This study aimed to describe the morbidity profiles of epidemiologically excluded COVID-19 patients during the pandemic in the primary care setting of the Anuradhapura District of Sri Lanka.

**Methods** This cross-sectional healthcare institution-based study collected morbidity profiles from six state-owned and five private primary care facilities (PCFs) in the Anuradhapura District during the third wave of the COVID-19 pandemic. Reasons for Encounters (RFEs) were recorded from physically available and epidemiologically excluded COVID-19 patients in a paper-based data format and coded using the International Classification of Primary Care.

**Results** Out of 1630 primary care encounters, 187 RFEs were identified. Most patients were females ($n=899$, 55%) and in the adult age category ($n=1297$, 79%). The median age of the patients was 39 years (interquartile range: 21–55). Older patients were likelier to seek primary care in the state sector ($p<.001$). Most children presented to the private sector compared to state PCFs ($p<0.001$). The majority of females significantly utilised state sector PCFs ($p=0.043$). Upper respiratory tract infections ($n=154$, 9.00%) were the most common RFE. The highest burden of systemic RFEs was associated with dermatological ($n=294$, 18%) and respiratory conditions ($n=274$, 16%). More than one-third of adults ($n=487$, 37.5%) suffered from a self-reported non-communicable disease (NCD). Hypertension ($n=235$, 48%), diabetes mellitus ($n=184$, 38%), and dyslipidemia ($n=134$, 28%) were the most observed NCDs. Multimorbidity was reported in 195 (40%) adult patients with an NCD.

**Conclusion** The pandemic has led to a shift in primary care morbidity profiles, with a higher incidence of dermatological and respiratory diseases and NCDs among healthcare seekers. Patients sought care from the state and private

*Correspondence:
Parami Abeyrathna
paramiluck@med.rjt.ac.lk
Full list of author information is available at the end of the article

sector differently depending on age, sex, and nature of illness. Primary care services must prepare to adapt to changes in healthcare-seeking patterns and morbidity profiles during pandemics to ensure comprehensive care is available on demand.

**Keywords** Primary care, Morbidity, COVID-19 pandemic, Non-communicable diseases, Healthcare utilisation

## Introduction

The coronavirus disease (COVID-19) pandemic has emerged as one of the most significant global health challenges of the twenty-first century, impacting healthy lifestyles and transforming healthcare systems worldwide. After the first case of COVID-19 was detected in December 2019 in Wuhan, China, the WHO declared a Public Health Emergency of International Concern (PHEIC) on January 30 2020 [1]. The PHEIC was declared over by May 05 2023, and during this period, COVID-19 spread globally with varied complexity, taking the lives of millions. As a prompt response, the primary care system underwent promising structural and strategic changes in service provisions to fully commit to all disease prevention activities related to COVID-19 [2]. While there was an overwhelming demand for the prevention of COVID-19 in the health sector, non-COVID-19 medical illnesses also contributed to significant morbidity. The latter was primarily underreported in health system research, and there is insufficient evidence to support comparisons during the pandemic.

Pre-pandemic morbidity due to non-communicable diseases (NCDs) was significant because they accounted for 44% of global deaths, above all other medical conditions [3]. Ischaemic heart diseases and cancer were the leading causes of death globally and regionally in high and upper-middle-income Asia–Pacific countries [3, 4]. Psychiatric illnesses have resulted in noteworthy mortality, and they were among the top ten causes of global deaths in 2019 [3]. According to a survey conducted in the United States, septicemia, cardiac conditions (heart failure, myocardial infarction, cardiac arrhythmias), and renal failure were the most common causes of hospital admissions [5]. However, among Asian countries, accidents, poisoning and violence, infections of the skin and other subcutaneous tissues, intestinal infectious diseases and disorders in the gall bladder, biliary tract and pancreas were associated with higher hospital morbidity [6]. A systemic review conducted in 12 countries across five continents revealed that upper respiratory infections and hypertension were among the most frequent clinician-reported primary care encounters (PCE), and cough, back pain, and abdominal symptoms were the most patient-reported conditions [7].

With the pandemic, the primary care settings observed a considerable reduction in patients diagnosed with cardiovascular risk factors, chronic disease conditions, and several malignancies [8, 9]. The trend of deaths by communicable diseases was augmented with COVID-19-associated respiratory tract infections by the end of 2021 [10]. During the pandemic Alzheimer's and other dementias were a leading cause of death among United States citizens [11]; however a less burden of mental health-related issues has been reported in other countries [9, 12]. The main reasons for Canadian hospital admissions in 2021 and 2022 were childbirth, COVID-19, heart failure, heart attack and substance use disorders [13]. In the United Kingdom, the weekly reported incidents of asthma, intestinal infectious diseases, and acute respiratory tract infections were significantly reduced during the COVID-19 pandemic [14]. Routine follow-up visits were substantially reduced for patients with renal, cardiac and neurologic problems and patients obtaining antiretroviral treatments [15].

The changes in the morbidity patterns observed in the pandemic compared to the pre-pandemic period led to a transformation in healthcare delivery and utilisation patterns among healthcare seekers [16, 17]. A study in a rural district of India reported that the prevalence of COVID-19-induced healthcare facility avoidance was 15.5% [18]. Patients' negative perceptions of healthcare systems being overstretched, fear of COVID-19 exposure in public places, and directives to self-isolate kept more patients at home, preventing them from seeking care from hospitals [17]. While there is an extensive research on COVID-19-related morbidity and mortality in Asian countries, data on non-COVID-19 patients in primary care is insufficient for evaluating morbidity patterns.

Sri Lanka is a low-middle-income country with better maternal and child health indicators [19] and universal health coverage than other South Asian countries [20]. There have been a minimum number of pandemic disasters encountered by Sri Lankans before the COVID-19 pandemic, e.g. dengue, measles, and leptospirosis [21]. The mortality patterns of NCDs in pre-pandemic had been similar to global trends and were mainly caused by ischaemic heart disease, malignancies and cerebrovascular conditions [19]. The most reported pre-pandemic reasons for hospital admissions in the country were traumatic injuries, abnormal clinical and laboratory findings, diseases of the urinary and gastrointestinal systems and obstetric conditions [19]. The most clinician-reported

reasons for primary care visits in state and private sectors were respiratory tract infections and fever [22], and patient-reported reasons were body aches and pains, cough and cold, and abdominal pain [23]. With the COVID-19 outbreak, essential services for endemic diseases such as dengue were reported to be compromised and insufficient in Sri Lanka [24]. The annual 58 million state-sector outpatient consultations [25] were reduced by 34% during the pandemic [19]. However, little is known about the specific impact of the pandemic on the primary care morbidity profiles in Sri Lanka. This study aimed to explore the morbidity profiles of epidemiologically excluded COVID-19 patients attending primary care facilities (PCFs) in the Anuradhapura district of Sri Lanka during the third wave of the COVID-19 outbreak.

## Methods

### Study design and setting

This PCF-based cross-sectional study was conducted in the Anuradhapura District of Sri Lanka from October 2021 to January 2022. The third wave of COVID-19 in Sri Lanka lasted from April to December 2021. Since September 2021, the epi curve of COVID-19 has flattened in Sri Lanka [26]. The data collection started after the lockdown when public travel and transport regulations were less-restricted in the country.

The Anuradhapura district is the largest of all 25 districts in Sri Lanka, with nearly 1 000 000 people, of which approximately 94% live in rural. The majority of the population depends on the allopathic system for healthcare needs. Both the state and private sectors provide primary care services. The allopathic sector PCFs included 21 primary medical care units (PMCUs), 33 divisional hospitals (DHs) and, six outpatient departments (OPDs) of base hospitals (BHs) and the teaching hospital (TH). Although PMCUs and DHs lack most investigations except for few blood and urine tests, the OPDs of secondary and tertiary hospitals perform these tests on demand within the premises free of charge. Approximately two million outpatient attendance was reported in the district by 2020, and BHs and DHs recorded the highest number of visits [19].

The private sector mainly consists of private hospitals with OPDs and general practices (GPs), but data on the exact number of private sector PCFs is unavailable. Private hospitals with OPDs typically provide paid diagnostic investigations, which include most of of haematological, biochemical, pathological, and radiological tests. Some of the vaccines in Sri Lanka's 'Expanded Program on Immunisation' are available in the private sector. GPs are small-scale PCFs led by a medical officer with fewer facilities for haematological and biochemical investigations, which private laboratories mediate.

### Study population and sample selection

The sample size was calculated to identify an illness presenting to the PCF with a minimum prevalence of 4% and an absolute precision error of 0.01%. The estimated minimum effective sample size was 1475. The state and private sector samples were divided in a 4:3 ratio, reflecting the proportion of Sri Lankan households utilising either a state or private PCF within the previous month [27]. Accordingly, the minimum morbidity profiles expected from state and private sector PCFs were 842 and 632. The sample size of each state PCF at the primary, secondary, and tertiary levels was calculated by the probability proportionate to previous year's outpatient attendance at each level of care. The researchers decided on the number of PCFs to meet the estimated sample size at different levels of care, and five state PCFs were selected. A consecutive sample was selected until the expected sample sizes allocated for each PCF were reached. At the primary level of care, two DHs (Rambewa, Parasangaswewa) and a PMCU (Puliyankulama); at the secondary level of care, two OPDs of BHs (Medawachchiya, Padaviya) and at the tertiary level of care, the OPD of the TH of Anuradhapura were included in the study.

Due to the unavailability of a proper database on private sector GPs, selection of private PCFs was based on a convenient sampling method. The study included GPs with more than ten daily PCEs and those located in different residential areas. The five GPs were from 'Saliya Mawaththa', 'Saliyapura' 'Mihinthale', 'Puvarasankulama' and 'Nochchiyagama'.

All patients attended to state OPDs from 8.00 am to 4.00 pm on weekdays, and GPs from 4.00 pm to 8.00 pm daily were selected for the study. The patients were eligible for the data collection if they were physically available at the PCF. Epidemiologically, COVID-19 was excluded before outpatient consultation by evaluating records of patient self-triage and healthcare worker-mediated triage, per guidelines issued by the Ministry of Health Sri Lanka (MoH). Next, the patients highly suspicious of COVID-19 were referred to receiving centres in state PCFs [28]. The diagnostic tests (rapid antigen test or RAT) were not used outpatient to confirm COVID-19 except for specific criteria given by the MoH [29]; thus, confirmation of COVID-19 status except for epidemiological criteria was challenging.

### Study instruments and data collection

The development of the study instrument 'The Patient Morbidity Profile Collector' (PMPC) (Additional file 1) originated from the primary care coding system introduced by the WONCA (World Association of Family Doctors), 'The International Classification of Primary

Care (ICPC)' [30]. ICPC is divided into 17 chapters by body systems to recognise the reason for encounters (RFEs) based on the localisation and nature of the problem or disease. It also includes a chapter on recognising PCEs for general processes in primary care, such as health consultation, counselling, and wound care. The paper-based PMPC recorded socio-demographic details of patients such as patients' age, sex, occupation, type of residency and civil status. The disease-related data recorded were the presenting complaint or RFE, duration of symptoms, associated symptoms, limitations to daily activities, past medical history, examination findings, most probable diagnosis of the doctor, ICPC code, nature of encounter and management process. Chronic diseases were identified if any self-reported medical conditions existed for more than one year and if the patients were ongoing medical follow-ups.

The trained MBBS graduates completed the PMPC after obtaining informed written consent. Demographic information was collected while patients waited for their consultation, and RFEs were gathered during the consultation.

### Data analysis

IBM SPSS statistics (Statistical Package for the Social Sciences), version 24, was used for the analysis. Missing data within the dependent variables were excluded at the first data analysis stage. The descriptive statistics were performed to describe sample characteristics and RFEs based on systemic complaint under each ICPC chapter. The association of patients' age and sex with the choice of sector of PCF was analysed using the chi-square test. The significance of the difference in the median age and the choice of PCF was analysed using the Mann–Whitney U Test. The significance of the duration of an illness and age category was analysed using the Kruskal–Wallis test.

'Multimorbidity' was defined as "the co-occurrence of multiple chronic diseases and medical conditions within one person without any reference to an index condition" [31].

## Main results

### Socio-demographic profile

A total of 1630 RFEs were recorded from patients who presented to the eleven selected PCFs in the Anuradhapura district. Out of the total PCEs, 688 (42%) were from the private sector, 258 (16%) were from the DHs and PMCU, 464 (29%) were from BHs, and 220 (14%) were from TH. The median age of the patients was 39 years (interquatile range: 21–55), ranging from day one from birth to 94 years. The median age of patients who presented to a state PCF was significantly higher than that of a private PCF as determined by Mann-Whitney U Test (, $p < 0.001$).

The majority of children (1–12 years) and adolescents (13–17 years) presented to private sector facilities Table 1). Most older adults (65 years and older) presented to state sector PCFs. Both male and females mainly utilised state PCFs. There was a significant association between the choice of the PCF with patients' category of age, $p < 0.001$ and sex, $p = 0.043$.

Table 1 includes age and sex-related variables, with subcategories for each variable. Statistical significance is indicated by the chi-square test results, with $p$-values provided for age and sex variables.

### Acute RFEs in primary care

The PMPCs revealed 187 different RFEs among the patients (Additional file 2). RFEs were classified based on the nature of the encounters, namely "diagnostic" ($n = 1448$, 89%), "routine check-ups" ($n = 135$, 8%), "screening for diseases" ($n = 34$, 2%) and "immunisation" ($n = 13$, 1%). The state sector was mainly utilised for all these encounters significantly over the private sector ($p < 0.001$). The median duration of symptoms of an acute illness before the first PCE was three days (interquartile range:1–6.5), which differed between age categories ($p < 0.001$- Kruskal–Wallis test).

**Table 1** The socio-demographic composition of the 1630 morbidity profiles of epidemiologically excluded COVID-19 primary care attendees in Anuradhapura District during the third wave of the COVID-19 pandemic

| Socio-demographic characteristic | Variable category | Encounters at state sector primary care facilities n(%) | Encounters at private sector primary care facilities n(%) | Total encounters n(%) | Chi-square significance |
|---|---|---|---|---|---|
| **Age** | Newborns and Infants (below 1 year) | 7(50) | 7(50) | 14(< 1) | $p < 0.001$ |
| | Children (1–12 years) | 88(35) | 161(65) | 249(15) | |
| | Adolescents (13 years through 17 years) | 24(34) | 46(66) | 70(4) | |
| | Adults (18 years or older) | 687(63) | 411(37) | 1098(67) | |
| | Older adults (65 years and older) | 136(68) | 63(32) | 199(12) | |
| **Sex** | Male | 440(60) | 291(40) | 731(45) | $p = 0.043$ |
| | Female | 502(56) | 397(44) | 899(55) | |

The top four most reported RFEs were upper respiratory tract infections (URTI, n = 154, 9%), dysuria (*n* = 73, 4.5%), heartburn (*n* = 72, 4,4%), and musculoskeletal symptoms/other (*n* = 63, 3.9%) (Additional file 3).

The median age of a patient with URTI was 23 years (interquartile range: 10–44). A higher incidence was seen in pediatric and young adult age groups. and in female patients (*n* = 85, 55%). Three patients presented with URTI but highly suspicious of COVID-19 were referred.

Most RFEs were reported in the dermatological (*n* = 294, 18%), respiratory (*n* = 274, 16.8%), and orthopaedic (*n* = 239, 14%) categories, while the fewest occurred in the urogenital category (*n* = 1, < 0.1%) (Fig. 1).

Figure 1 illustrates the systemic classification of patient encounters categorized by various symptoms. The data compares the number of patients treated for each symptom in the private sector versus the state sector. The symptoms are grouped into several categories, including dermatological, orthopedic, abdominal, renal, general processes (e.g.dressing/ pressure/ compression/ tamponade), respiratory, cardiological, neurological, general symptoms (e.g. fever), eye, endocrine, ear, gynecological, psychiatric, hematological, obstetric, and urogenital. The bar graph displays the number of patients on the x-axis, with the y-axis representing different symptom categories.

A diverse array of dermatological conditions was observed, ranging from abundant animal or human bites (*n* = 48, 2.9%), lacerations/cuts (*n* = 36, 2.2%), skin infections/post-traumatic (*n* = 34, 2.1%) to the least observed skin candidiasis and bruises/ contusions (*n* = 1, < 1%). Localised (*n* = 20) and generalised rashes (*n* = 17) and dermatitis (*n* = 19) were also abaundant in this region. Most dermatological conditions were either referred to a clinic or ward (*n* = 176, 59%), or undergone procedures (n = 78, 27%).

The most prevalent orthopaedic conditions were musculoskeletal symptoms/other (n = 63, 3.9%), musculoskeletal pains (*n* = 27, 1.7%) and, osteoarthrosis of the knee (*n* = 55, 3.4%). Bone fractures were present in six patients (0.4%). Five were referred to surgical

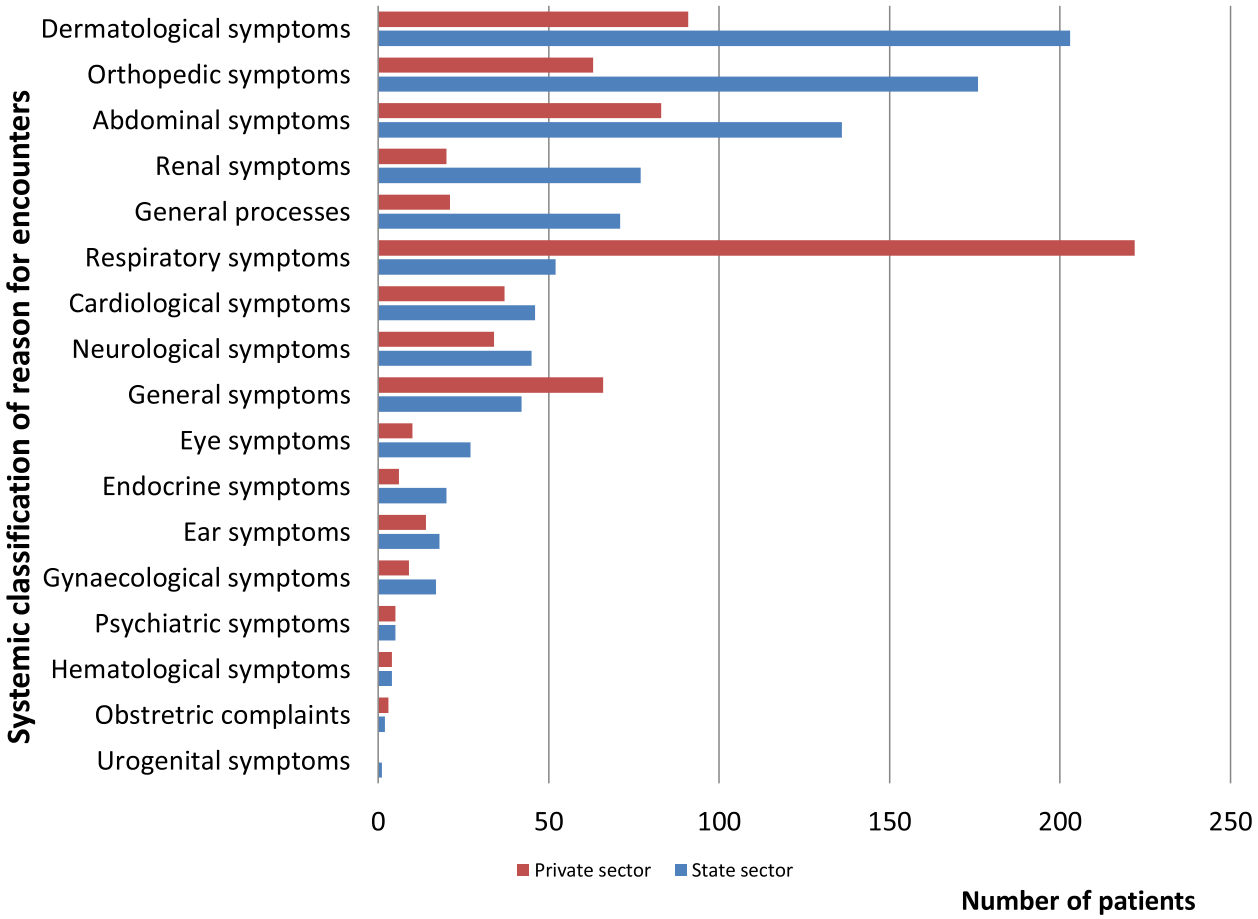


**Fig. 1** Systemic classification of reason for encounters and the choice of primary care facility

and orthopaedic units in relevant hospitals for further investigation.

The obstetric ($n=5$), haematological ($n=8$), and urogenital ($n=1$) categories reported the lowest number of RFEs. Only 0.6% ($n=10$) of the patients reported psychological symptoms, which included depressive feelings ($n=5$) and anxiety ($n=2$).

Most respiratory ($n=222$) and general symptoms ($n=66$), were presented to the private sector (Additional file 4). Urban and suburban PCFs reported the most RFEs by URTI ($n=122$) and dysuria ($n=34$). Rural PCFs significantly encountered patients with knee osteoarthritis ($n=33$).

### NCDs and multimorbidity

More than one third of adults ($n=487$, 37.5%) suffered from a self-reported NCD. The median age of presentation an NCD was 57 years (interquartile range: 66–45). A total of 297 (61%) NCDs were from female patients. Most patients with an NCD attended the state sector ($n=352$, 72%) and suburban PCFs ($n=190$, 39%). Hypertension ($n=235$, 48%), diabetes mellitus ($n=184$, 38%), dyslipidemia ($n=134$, 28%), bronchial asthma ($n=68$, 14%), chronic kidney disease ($n=41$, 8%) and ischemic heart disease ($n=40$, 8%) were the most observed self-reported NCDs in the study. Multimorbidity was reported in 40% ($n=195$) of adult patients with an NCD and occurred more frequently in the middle-age categories (Fig. 2).

Figure 2 illustrates the number of comorbidities among patients across various age groups. The age groups are categorized as follows: 18–29, 30–40, 41–49, and 50–60. The y-axis represents the number of comorbidities, ranging from 0 to 5, while the x-axis shows the number of patients. The bars indicate the distribution of comorbidities within each age group, providing insights into the prevalence of comorbidities as patients age.

Hypertension-diabetes mellitus and hypertension-dyslipidemia were the most reported NCD combinations. One patient had presented with a multimorbidity of five NCDS, including diabetes, hypertension, heart disease, dyslipidemia and chronic kidney disease. Sixteen patients were suffered from four of the NCDs concurrently. Most

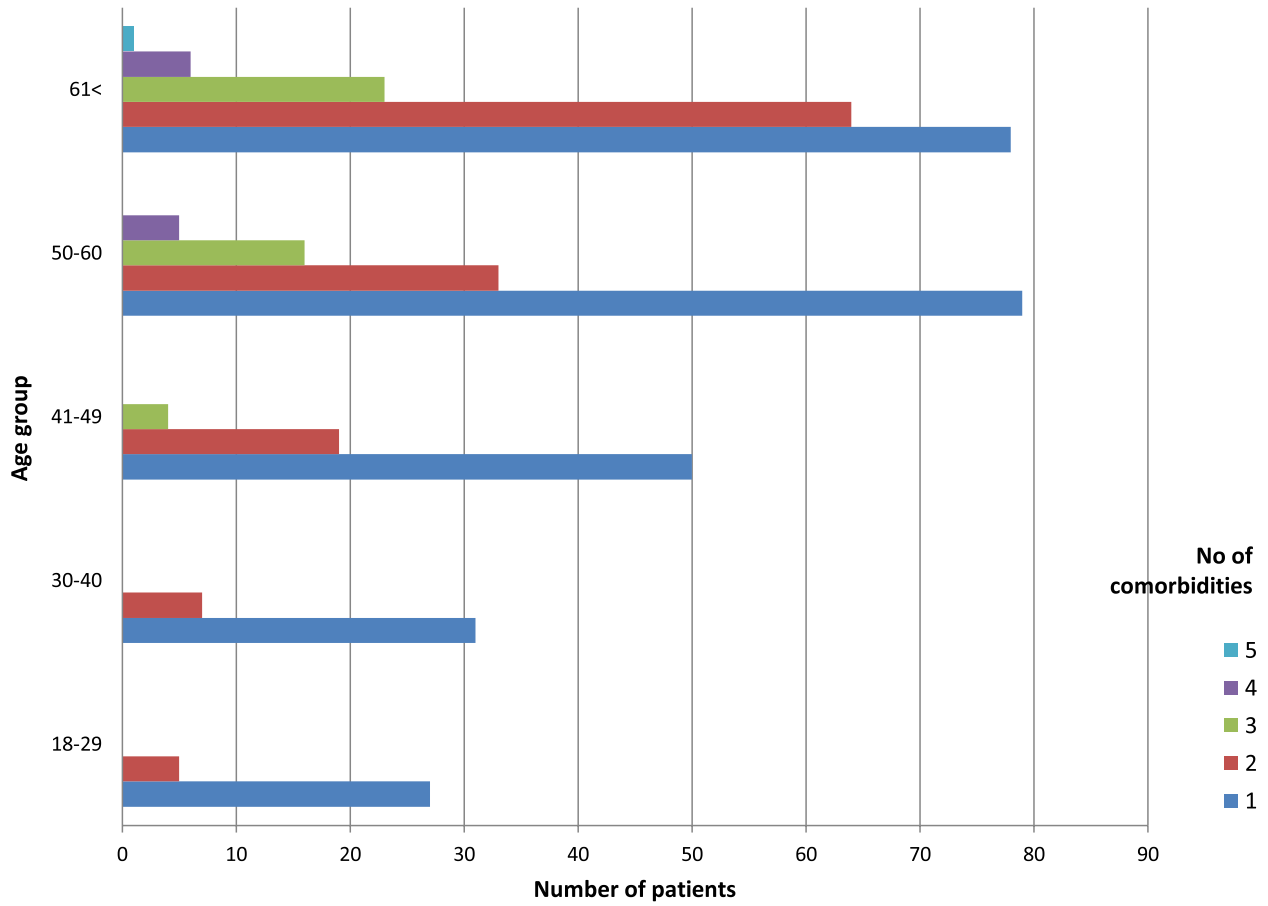


**Fig. 2** The burden of comorbidities among adult primary care attendees in the Anuradhapura district of Sri Lanka during the third wave of the COVID-19 pandemic

multimorbid patients utilised the state sector PCFs over the private sector ($p < 0.001$).

Blood pressure screening was performed in 310 (23%) adult patients, and the median systolic and diastolic blood pressures were 130 mmHg (interquartile range: 119–150) and 80 mmHg (interquartile range 67–90), respectively. Body Mass Index (BMI) was assessed in 82 adults, and the median BMI was 23 kg/m$^2$ (interquartile range: 21–26).

## Discussion

The present study investigated the common morbidity patterns in the primary care setting of the Anuradhapura district of Sri Lanka during the third wave of the COVID-19 pandemic. This study is among the few studies assessing primary care morbidity profiles of non-COVID-19 patients during the pandemic and contributes to evidence-based morbidity assessments in Sri Lanka [23, 32, 33].

The socio-demographic profiles of the primary care attendees during the pandemic reported a dynamic pattern in healthcare utilisation. The first COVID-19 case in Sri Lanka was reported on March 11 2020, and the first lockdown-type curfew was imposed on March 20 2020 [34]. The effect of COVID-19 changed over the next three years, resulting in three waves with fluctuating daily cases and mortality [35, 36]. However, the pandemic exerted increased strain on the local health system, overwhelming its capacity by the middle of the second wave [37]. Hospitals have considerably changed routine operational procedures, such as cancelling routine clinics, OPD, and surgeries [38]. The state OPDs had dedicated areas for detecting COVID-19 cases. In addition, telemedicine involved in triage -related to COVID-19 diagnosis and provision of e-prescriptions from the GPs [39]. The health advise for strict safe distancing in public places, anxiety and fear of COVID-19 contamination from crowds diverted vulnerable populations such as children and older adults to less restrictive private sector PCFs.

This study reported that among the epidemiologically excluded COVID-19 PCEs, female patients (55%) composed the majority, which is predictable considering the demographics in the pre-COVID period in Sri Lanka [33, 40]. Children and male patients mainly utilised the private sector for acute healthcare needs. Gender disparities in healthcare visits were observed in numerous pandemic-related studies [41, 42]. The healthcare authorities should improve more gender-oriented and age-adjusted primary care services during the pandemic to minimize healthcare disparities.

The findings of this study are consistent with the previous local studies reporting URTI as one of the most common RFEs [23, 32, 33]. Viral URTI usually exhibits a stable seasonal pattern in both the dry and wet zones of Sri Lanka [43]. Due to the emergence of co-viral infections, the epidemiology of viral URTI deteriorated during the pandemic [44]. Although respiratory conditions were reduced with the lockdowns and followed respiratory hygienic protocols, a 30% increase in pandemic-related respiratory conditions was observed [45]. The COVID-19 pandemic reinforced strategies for the early detection of infectious outbreaks through the present surveillance system [46]. More sentinel surveillance centres need to be established in local primary care settings to identify respiratory morbidity patterns and introduce early regulatory interventions for viral outbreaks.

A higher prevalence of dermatological conditions was observed in this district, similar to country-level data from the pre-COVID-19 period [23, 32, 33]. The tropical climate and higher humidity from October to January resulted in increased incidence rates of fungal skin infections [47] and animal bites in the region [48]. The morbidity profile of outpatient dermatological conditions changed during the COVID-19 pandemic based on country-specific disease control measures, the effect of COVID-19 on healthcare staff [49] and tele-dermatological consultations [50]. About three per cent of dermatological conditions were caused by injuries and trauma. Annual health statistics report a 14% drop in traumatic injuries presented to OPDs during the pandemic but a marked increase in home-related injuries caused by lockdowns and travel restrictions [51]. The availability of vaccination and surgical facilities free of charge and the state doctors' technical compliance have encouraged patients to utilise state OPDs more for animal bites. Primary care doctors need comprehensive training to manage common dermatological conditions effectively, enabling them to address a significant amount of dermatology-related encounters.

This study revealed a marked reduction in psychiatric conditions among primary care attendees, an unexpected observation compared to the pandemic period. With the COVID-19 pandemic, a significant burden of psychological issues was observed among frontline workers (depressive symptoms in 39%, anxiety in 55% ) and patients (depression in 18.6% and anxiety in 11.2%) [52, 53]. Although specialised psychiatric outpatient routine care is provided at secondary and tertiary state hospitals in Sri Lanka, a 16% decline in psychiatric clinic attendance was reported in 2021 compared to 2020 [51]. The identification of mental health conditions in primary care significantly reduced during the COVID-19 pandemic [54]. A tertiary care-based study in South Korea found an association between the reduction in daily psychiatric conditions and the increasing daily number of newly confirmed COVID-19 cases [55]. Lockdowns, social

distancing, fear of contamination, telepsychiatry and pandemic-enhanced fear of judgment and stigmatization would have led to reduced use of outpatient and clinic care for mental health-related issues. Comprehensive and accessible services for mental health disorders should be available within PCFs to help patients overcome barriers and increase healthcare seeking during the pandemic.

This study highlights the importance of delivering comprehensive care for patients with NCDs and multimorbidity in state and private sector PCFs during a pandemic. During the COVID-19 outbreak, routine clinics were drastically disrupted, and routine medications were dispatched to the homes as a strategy to continue to care for patients with NCDs [56]. This study's findings indicate that NCDs are a significant health concern, affecting one-third of adult patients. Cardiovascular diseases, one of the highly prevalent NCDs in the country contributed to 83% of the local deaths in 2018 [57]. The current primary care setting reported a similar morbidity burden of hypertension and diabetes compared to the prepandemic period [40]. Multimorbidity reported from the current rural primary care setting is lower compared to prepandemic urban studies [40]. A similar pattern of increased morbidity due to NCDs was observed in other South Asian studies [58]. Managing comorbidities was a key strategy postively linked to improved mortality from COVID-19 [59]. However, the interrupted healthcare services raised the unmet need for routine care, leading to an increase in non-COVID-19-related morbidity and mortality during and after the pandemic [60]. During pandemics, routine outpatient care must continue by ensuring adequate human and physical resources while implementing prevention strategies aimed at high-risk and high-demand populations.

### Limitations

Selection bias might affect the PMPCs collected from the private sector, since the convenience sampling method was used due to lack of a GP register in the district. Excluding suspected COVID-19 patients leads to an underestimation of respiratory morbidity. WHO recommended triage and case definitions were adapted for epidemiologically exclusion of COVID-19 at PCFs. However there remainsa possibility of unconfirmed COVID-19 cases presenting with respiratory and non-respiratory symptoms.

## Conclusion

Dermatological, respiratory, and orthopedic conditions represented a significant proportion of primary care morbidity among the epidemiologically excluded COVID-19 patients during the pandemic. The pandemic has led to a reduction in PCEs due to genito-urinary, haematological, obstetric, and psychiatric conditions, which need further evaluation. A disparity in the utilisation of state and private sector PCFs was observed based on the nature and severity of the RFEs and the age and sex of the patient. It is recommended that primary care settings be modified to provide more accessible and comprehensive services that are tailored to different genders and age groups, especially during pandemics. There is an increasing trend in multimorbidity within primary care, which requires primary care-level opportunistic interventions for disease prevention, while tailoring for the increasing demand during pandemics.

#### Abbreviations

| | |
|---|---|
| BH | Base hospital |
| COVID-19 | Coronavirus disease |
| DH | Divisional hospital |
| GP | General practices |
| ICPC | International Classification of Primary Care |
| MoH | Ministry of Health |
| NCD | Non-communicable diseases |
| OPD | Outpatient department |
| PCE | Primary care encounters |
| PCF | Primary care facilities |
| PHEIC | Public Health Emergency of International Concern |
| PMCU | Primary medical care unit |
| PMPC | Patient Morbidity Profile Collector |
| RFE | Reason for the encounter |
| TH | Teaching hospital |
| URTI | Upper respiratory tract infection |

## Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12875-025-02792-3.

Additional file 1. The paper based data collection format used for collecting patient morbidity profiles.

Additional file 2. A summary of the all reason for encounters and ICPC codes of epidemiologically excluded COVID-19 patients presented to primary care facilities of Anuradhapura district of Sri Lanka during the third wave of COVID-19.

Additional file 3. A summary of the morbidity data of commonest reasons for encounters.

Additional file 4. The choice of primary care facilities based on socio-demographic factors.

#### Acknowledgements

We acknowledge the World Organization of Family Doctors, WONCA, for providing the International Classification of Primary Care - revised version 2 (ICPC-rv2) for data coding and analysis in this research study.

#### Authors' contributions

All authors contributed to the conceptualising, methodology, investigation, data analysis, visualisation, and validation of the study findings. P.A. contributed to funding acquisition and writing the original draft. S.B.A., S.S., and P.H.G.J.P. contributed to supervising, reviewing, and editing the manuscript.

#### Funding

The Rajarata University Research Grant supported this work under grant number RJT/R&PC/2021/R/FMAS/01. P.A. acquired the funds. The funders had no role in the study design, data collection and analysis, decision to publish, or preparation of the manuscript.

**Data availability**
TThe datasets used and/or analysed during the current study are available from the corresponding author upon reasonable request.

## Declarations

**Ethics approval and consent to participate**
Ethical approval was obtained from the Faculty of Medicine and Allied Sciences Ethics Review Committee, the Rajarata University of Sri Lanka, under ERC/2020/66. Informed consent was obtained from all adult participants, and assent was obtained from the guardians of children younger than 18. An information sheet in Sinhala, Tamil and English was shared among the participants to explain the aim of the study. No incentives were given to the study participants during the data collection. Before data collection, approval from healthcare institutions was obtained from the directors and medical officers of state hospitals and private sector primary care facilities.

**Consent for publication**
Not applicable.

**Competing interests**
The authors declare no competing interests.

**Author details**
[1]Department of Family Medicine, Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka, Anuradhapura, Sri Lanka. [2]Center for Public Health, Anuradhapura, Sri Lanka. [3]Department of Family Medicine, Faculty of Medical Sciences, University of Sri Jayawardhanapura, Nugegoda, Sri Lanka.

Received: 10 April 2024 Accepted: 14 March 2025
Published online: 03 April 2025

**References**

1. World Health Organization. Europe. Emergencies. Coronavirus disease (COVID-19) pandemic. 2023. Available from: https://www.who.int/europe/emergencies/situations/covid-19. Accessed 19 Feb 2024.
2. Yang C, Yin J, Liu J, Liu J, Chen Q, Yang H, et al. The roles of primary care doctors in the COVID-19 pandemic: consistency and influencing factors of doctor's perception and actions and nominal definitions. BMC Health Serv Res. 2022;22(1):1–10. https://doi.org/10.1186/s12913-022-08487-0.
3. World Health Organization. The top 10 causes of death. 2020. Available from: https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death. Accessed 15 Oct 2022.
4. OECD WHO. Mortality from all causes. In: Health at a Glance: Asia/Pacific. 2020. https://doi.org/10.1787/26b007cd-en. Accessed 20 Oct 2023.
5. Salah HM, Minhas AMK, Khan MS, Pandey A, Michos ED, Mentz RJ, et al. Causes of hospitalization in the USA between 2005 and 2018. Eur Hear J Open. 2021;1(1). https://doi.org/10.1093/ehjopen/oeab001.
6. DATA.GOV.SG.Top 10 Conditions of Hospitalisation. Available from: https://data.gov.sg/dataset/top-10-conditions-of-hospitalisation?view_id=736c593c-61e1-4773-a0db-39471d9953a0&resource_id=d40e7d15-cd97-4aa2-922d-403248b6bb33. Accessed 13 Mar 2024.
7. Finley CR, Chan DS, Garrison S, Korownyk C, Kolber MR, Campbell S, et al. What are the most common conditions in primary care? Systematic review. Can Fam Physician. 2018;64(11):832–40 PMC6234945.
8. Sisó-Almirall A, Kostov B, Sánchez E, Benavent-àreu J, González-De PL. Impact of the COVID-19 pandemic on primary health care disease incidence rates: 2017 to 2020. Ann Fam Med. 2022;20(1):63–8. https://doi.org/10.1370/afm.2731.
9. Van den Bulck S, Crèvecoeur J, Aertgeerts B, Delvaux N, Neyens T, Van Pottelbergh G, et al. The impact of the Covid-19 pandemic on the incidence of diseases and the provision of primary care: a registry-based study. PLoS ONE. 2022;17:1–13. https://doi.org/10.1371/journal.pone.0271049.
10. World Health Organization. Weekly epidemiological update on COVID-19 - 28 December 2021. Emergency situation updates. 2021. Available from: https://www.who.int/publications/m/item/weekly-epidemiological-update-on-covid-19---28-december-2021. Accessed 30 Mar 2023.
11. Center for Disease Control. Faststats, National Center for Health Statistics. 2021. Leading Causes of Death. Available from: https://www.cdc.gov/nchs/fastats/leading-causes-of-death.htm. Accessed 15 Mar 2023.
12. Yonemoto N, Kawashima Y. Help-seeking behaviors for mental health problems during the COVID-19 pandemic: a systematic review. J Affect Disord. 2023;323:85–100. https://doi.org/10.1016/j.jad.2022.11.043.
13. Canadian Institute for Health Information. Inpatient Hospitalization, Surgery and Newborn Statistics, 2021–2022 Canada. 2023. Available from https://www.cihi.ca/en/hospital-stays-in-canada-2021-2022#:~:text=The%20most%20common%20reason%20for,acute%20LOS%20of%202.7%20days. Accessed 15 Jan 2024.
14. Royal Australian College of General Practitioners. RSC: Public health data. 2020. Available from: https://www.rcgp.org.uk/representing-you/research-at-rcgp/research-surveillance-centre/public-health-data. Accessed 15 Jan 2024.
15. Abebe W, Worku A, Moges T, Tekle N, Amogne W, Haile T, et al. Trends of follow-up clinic visits and admissions three-months before and during COVID-19 pandemic at Tikur Anbessa specialized hospital, Addis Ababa, Ethiopia: an interrupted time series analysis. BMC Health Serv Res. 2021;21(1):1–10 Available from: https://pubmed.ncbi.nlm.nih.gov/34301264/.
16. Huston P, Campbell J, Russell G, Goodyear-Smith F, Phillips RL, van Weel C, et al. COVID-19 and primary care in six countries. BJGP Open. 2020;4(4):1–6 Available from: https://bjgpopen.org/content/4/4/bjgpopen20X101128.
17. Bodilsen J, Nielsen PB, Søgaard M, Dalager-Pedersen M, Speiser LOZ, Yndigegn T, et al. Hospital admission and mortality rates for non-covid diseases in Denmark during covid-19 pandemic: nationwide population based cohort study. BMJ. 2021;373. Available from: https://www.bmj.com/content/373/bmj.n1135.
18. Oduro MS, Peprah P, Morgan AK, Agyemang-Duah W. Staying in or out? COVID-19-induced healthcare utilization avoidance and associated socio-demographic factors in rural India. BMC Public Health. 2023;23(1):1–16. https://doi.org/10.1186/s12889-023-16282-7.
19. Ministry of health Sri Lanka. Annual Health Bulletin. 2020. Available from: www.health.gov.lk . Accessed 01 Apr 2024.
20. World Health Organization. What is Universal Health Coverage?; 2019. Available from: https://www.who.int/health_financing/universal_coverage_definition/en/. Accessed 2022 Apr 8.
21. Unit E. Epidemiology Unit. High endemic diseases/outbreaks. 2022. Available from: https://www.epid.gov.lk/list-of-notifiable-diseases/list-of-notifiable-diseases.
22. Rannan-Eliya RP, Wijemanne N, Liyanage IK, Jayanthan J, Dalpatadu S, Amarasinghe S, et al. The quality of outpatient primary care in public and private sectors in Sri Lanka—how well do patient perceptions match reality and what are the implications? Health Policy Plan. 2015;30(suppl_1):i59-74. https://doi.org/10.1093/heapol/czu115.
23. Dharmaratne S, Agampodi S, Dassanayaka S, Kumarihami P, Ratnayake A, Wickramathilake S. Disease burden assessment beyond in-patient data: a morbidity profile assessment of outpatients. Int J Prev Med. 2012;3(10):730–2 Available from: /pmc/articles/PMC3483002/.
24. Niriella MA, Ediriweera DS, De Silva AP, Premarathna BH, Jayasinghe S, de Silva HJ. Dengue and leptospirosis infection during the coronavirus 2019 outbreak in Sri Lanka. Trans R Soc Trop Med Hyg. 2021;115:944–6 Available from:http://www.epid.gov.lk/web/.
25. Govindaraj R, Navaratne K, Cavagnero E, Seshadri SR. The world bank: health care in Sri Lanka: what can the private health sector offer?. 2014. Available from: http://documents.worldbank.org/curated/en/423511468307190661/pdf/899540WP0Box380th0Care0in0Sri0Lanka.pdf.
26. Ministry of Health, Sri Lanka. Epidemiology unit COVID - 19; 2022. Available from: https://www.epid.gov.lk/storage/post/pdfs/en_6401f1862b0cb_esummery-december.pdf. Accessed 25 Jan 2023.
27. Department of Census and Statistics Sri Lanka. Household income and expenditure. 2016. Available from: http://www.statistics.gov.lk/HIES/HIES2016/HIES2016_FinalReport.pdf. Accessed 8 Apr 2022.
28. Ministry of health Sri Lanka. COVID-19 (new Coronavirus) outbreak in Sri Lanka interim guidelines for Sri Lankan Primary Care Physicians (Version 03). 2020;19(Version 03):1–37.
29. Ministry of Health. Revised guidelines on laboratory testing strategy for COVID-19. 2021. http://old.epid.gov.lk/web/index.php?option=com_content&view=article&id=230&lang=ta&Itemid=.

30. World Organization of Family Doctors. International classification of primary care.. International classification of primary care. Available from:http://www.globalfamilydoctor.com. Accessed 01 Jun 2023.
31. Bayliss EA, Edwards AE, Steiner JF, Main DS. Processes of care desired by elderly patients with multimorbidities. Fam Pract. 2008;25(4):287–93 https://pubmed.ncbi.nlm.nih.gov/18628243/.
32. de Silva N, Mendis K. One-day general practice morbidity survey in Sri Lanka. Fam Pract. 1998;15(4):323–31. https://doi.org/10.1093/fampra/15.4.323. Cited 2019 Mar 23.
33. Alwis I, Rajapaksha B, Jayasanka C, et al. Morbidity profile and pharmaceutical management of adult outpatients between primary and tertiary care levels in Sri Lanka: a dual-centre, comparative study. BMC Prim Care. 2024;25:200. https://doi.org/10.1186/s12875-024-02448-8.
34. Ediriweera DS, de Silva NR, Malavige GN, de Silva HJ. An epidemiological model to aid decision-making for COVID-19 control in Sri Lanka. PLoS One. 2020;15(8).
35. Sri Lanka Health Promotion Bureau. Website. COVID 19 dashboard. Available from: https://hpb.health.gov.lk/covid19-dashboard/. Cited 2021 Jan 13.
36. World Health Organization. Coronavirus disease 2019 (COVID-19) situation report – 73. 2020. Available from: https://iris.who.int/bitstream/handle/10665/331686/nCoVsitrep02Apr2020-eng.pdf.
37. World Health Organization. Covid 19. 2022. Available from: https://covid19.who.int/region/searo/country/lk.
38. Munasinghe NL, O'Reilly G, Cameron P. Lessons learned from the COVID-19 response in Sri Lankan hospitals: an interview of frontline healthcare professionals. Front public Heal. 2023;11. Available from: https://pubmed.ncbi.nlm.nih.gov/38125853/.
39. Karunathilake I, Edirisinghe S, Weerasinghe M, Perera BJC, Hamdani A, Mudiyanse R, et al. An innovative telemedicine initiative from Sri Lanka: the value of volunteerism in a resource-constrained scenario during the COVID-19 pandemic. Asia Pac J Public Health. 2022;34(5):557–60. https://doi.org/10.1177/10105395221090348.
40. Prathapan S, Mestrige Chamath Fernando GV, Matthias AT, Arachchige Charuni YBM, Gayan Abeygunawardhana HM, Gayasha Kavindi Somathilake BG. The rising complexity and burden of multimorbidity in a middle-income country. PLoS One. 2020;15:1–14. https://doi.org/10.1371/journal.pone.0243614.
41. Williams R, Jenkins DA, Ashcroft DM, Brown B, Campbell S, Carr MJ, et al. Diagnosis of physical and mental health conditions in primary care during the COVID-19 pandemic: a retrospective cohort study. Lancet Public Heal. 2020;5(10):e543–50.
42. Mahuela L, Oliván-Blázquez B, Lear-Claveras A, et al. Use of health services and medication use, new comorbidities, and mortality in patients with chronic diseases who did not contract COVID-19 during the first year of the pandemic: a retrospective study and comparison by sex. BMC Health Serv Res. 2023;23:1364. https://doi.org/10.1186/s12913-023-10158-745.
43. Shapiro D, Bodinayake CK, Nagahawatte A, Devasiri V, Kurukulasooriya R, Hsiang J, Nicholson B, et al. Burden and seasonality of viral acute respiratory tract infections among outpatients in Southern Sri Lanka. Am J Trop Med Hyg. 2017;97(1):88–96. https://doi.org/10.4269/ajtmh.17-0032.
44. V Withanage. Other respiratory tract infections during the Covid 19 pandemic in Southern province, Sri Lanka. 2022. Available from: https://slmicrobiology.lk/2022/01/04/other-respiratory-tract-infections-during-the-covid-19-pandemic-in-southern-province-sri-lanka-2021/.
45. Maison N, Omony J, Rinderknecht S, Kolberg L, Meyer-Bühn M, von Mutius E, et al. Old foes following news ways?—Pandemic-related changes in the epidemiology of viral respiratory tract infections. Infection. 2023;1:1–10. https://doi.org/10.1007/s15010-023-02085-w.
46. EpidemiologyUnit. Communicable disease surveillance program of Sri Lanka. 2023. Available from https://www.epid.gov.lk/storage/post/pdfs/en_643fb35101272_en_641005964d33d_Communicable%20Disease%20Surveillance%20-%20Final.pdf. Accessed 30 Jan 2024.
47. Ibrahim M, Rabah A, Liman B, Ibrahim N. Effect of temperature and relative humidity on the growth of *Helminthosporium fulvum*. Niger J Basic Appl Sci. 2011;19(1):127–9. Available from https://www.ajol.info/index.php/njbas/article/view/69357/57383#:~:text=The%20result%20of%20the%20effect,after%204%20days%20of%20incubation.
48. Hsiao MH, Yang MC, Yan SH, Yang CH, Chou CC, Chang CF, et al. Environmental factors associated with the prevalence of animal bites or stings in patients admitted to an emergency department. J Acute Med. 2012;2(4):95–102. https://doi.org/10.1016/j.jacme.2012.09.002.
49. Bhargava S, Negbenebor N, Sadoughifar R, Ahmad S, Kroumpouzos G. Global impact on dermatology practice due to the COVID-19 pandemic. Clin Dermatol. 2021;39(3):479–87 Available from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8043816/.
50. Jones K, Lennon E, McCathie K, Millar A, Isles C, McFadyen A, et al. Teledermatology to reduce face-to-face appointments in general practice during the COVID-19 pandemic: a quality improvement project. BMJ Open Qual. 2022;11(2):e001789 Available from:https://bmjopenquality.bmj.com/content/11/2/e001789.
51. Ministry Of Health. Annual Health Bulletin 2021. Available from: http://www.health.gov.lk/moh_final/english/others.php?spid=26. Accessed 25 Jan 2023.
52. Sundarapperuma TD, Gamage MWK, Rathnayake N, Weeratunga EB, Jagodage HMH. Psychological disturbances encountered by the healthcare professionals, military professionals and general public in Sri Lanka during COVID-19 pandemic: a cross-sectional study. BMC Psychiatry. 2023;23(1):1–9 Available from https://pubmed.ncbi.nlm.nih.gov/37344813/.
53. Mirza JF, Wijayatilake, PVHDK, Ratnayake DRDL, Godavitharana AMM, Amarasinghe DK, Thennakoon, et al. Psychiatric morbidity among COVID-19 positive persons in Central Province, Sri Lanka: a cross-sectional study. Sri Lanka J Psychiatry. 2022;13(2):27–35. https://doi.org/10.4038/sljpsyc.v13i2.8375.
54. Segui FL, Guillamet GH, Arolas HP, Marin-Gomez FX, Comellas AR, Morros AMR, et al. Characterization and identification of variations in types of primary care visits before and during the covid-19 pandemic in catalonia: big data analysis study. J Med Internet Res. 2021;23(9):e29622 Available from: https://www.jmir.org/2021/9/e29622.Cited 2023 Nov 7
55. Seo JH, Kim SJ, Lee M, Kang JI. Impact of the COVID-19 pandemic on mental health service use among psychiatric outpatients in a tertiary hospital. J Affect Disord. 2021;1(290):279–83. https://doi.org/10.1016/j.jad.2021.04.070.
56. Munasinghe NL, O'Reilly G, Cameron P. Lessons learned from the COVID-19 response in Sri Lankan hospitals: an interview of frontline healthcare professionals. Front Public Health. 2023;6(11):1280055. https://doi.org/10.3389/fpubh.2023.1280055.
57. World Health Organization. Non-Communicable Diseases Sri Lanka Country Profile 2018. Available from https://www.who.int/publications/m/item/noncommunicable-diseases-lka-country-profile-2018. Accessed 12 Dec 2022.
58. Sahoo KC, Kanungo S, Mahapatra P, Pati S. Non-communicable diseases care during COVID-19 pandemic: a mixed-method study in Khurda district of Odisha, India. Indian J Med Res. 2021;153(5and6):649–57. https://doi.org/10.4103/0971-5916.323435.
59. Iaccarino G, Grassi G, Borghi C, Ferri C, Salvetti M, Volpe Massimo M. Age and multimorbidity predict death among COVID-19 patients. Hypertension. 2020;76(2). https://doi.org/10.1161/HYPERTENSIONAHA.120.15324.
60. Raknes G, Fagerås SJ, Sveen KA, Júlíusson PB, Strøm MS. Excess non-COVID-19 mortality in Norway 2020–2022. BMC Public Health. 2024;24(1):1–13. https://doi.org/10.1186/s12889-023-17515-5.


## Publisher's Note