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EXPERIENCE OF INDIVIDUALS WITH CARDIOVASCULAR DISEASE DURING COVID-19 PANDEMIC

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ABSTRACT

Background:

The COVID-19 pandemic triggered by the SARS-CoV-2 virus that first emerged in March 2020brought anincredible number of unknown questions that current research seeks to answer. One such unidentified is the relationship between cardiovascular disease and COVID-19. Existing literature has identified COVID-19 as a risk element for patients with cardiovascular disease having poor health outcomes, however, the rest of the information is limited.

Objectives:

This scoping review has two main objectives. First, report a possible connection between COVID-19 and cardiovascular disorders. Additionally, to figure out the experience of individuals with cardiovascular disease during the COVID-19 pandemic. Subsequently, the research questions regarding cardiovascular disease as a risk factor during COVID-19, the experience of quarantine period by cardiac patients during a pandemic, hospital management as well as self-management during a restricted period of pandemic and the long-term impact of COVID-19 on cardiac patientsare addressed in this writing. The second goal of this review is to identify the current literature gap in an existing piece of knowledge.

Method:

Literature was selected from Discover @Bolton, PubMed, google scholar and other academic sources with inclusion and exclusion standards.Following the selection procedure, the relevant literature was succinctly examined, and data from all the reviewed literature was organised according to the theme.

Result:

After the greatest inclusive criteria were used to filter the 1951 results from the original searches, only 183 items remained. Following a review of the 183 results' abstracts, 17 articles using the discover@Bolton tool were ultimately chosen. Then, after the second round of filtering using PubMed, 28 additional results were found, leading to a total of 45 papers that were primarily focused on and

critically examined based on inclusion and exclusion criteria. Due to their relevance to cardiovascular disease and COVID-19, 29 pieces of literature were included in the scoping review.

Conclusion:

In conclusion, this review study has effectively collated the body of literature on cardiovascular disease and COVID-19 and has identified areas that need further investigation.There is a clear explanation for how COVID-19 became associated with an increased risk of cardiovascular disease during the outbreak. Additionally, cardiac self-management was impacted by social withdrawal and lockout. The information acquired for this evaluation itself has limitations due to the COVID-19 timeline. Research on COVID-19 and cardiovascular problems, in general, are still in their infancy, and further research is necessary to get more conclusive conclusions.

Keywords:

INTRODUCTION

The introductory chapter entails the objectives for the fulfilment of research work undertaken for my degree. Chapter 1 has attempted to provide critically highlighted and investigated how COVID-19 and cardiovascular disease are relatedduring the pandemic period of coronavirus. In the area of health and social care, it gives an overview of COVID-19 and cardiovascular disease.Novel coronavirus was the initial name of COVID-19 by the WHO(world health organisation). Later, coronavirus has given the name that is severe acute respiratory syndrome (SARS) by the study group along with the disease called coronavirus disease 2019 (COVID-19) (Sammour. 2022, cited in Guo et al., 2020). Definitions of COVID-19, andcardiovascular disease (CVD), has considered along with policies and statistical reports. The legislative key issues or pattern within the area of health and social care sector has been figured out, to overwhelm the underlying topic of my research which is, "Experience of individuals with cardiovascular disease during COVID-19 pandemic".

1.1 COVID-19 Overview

COVID-19 commonly referred to as Coronavirus disease 2019, occurred due to SARS-CoV-2, Severe Acute Respiratory Coronavirus 2. COVID-19 virus, first found in Wuhan, a city in China,was deducted as a respiratory virus in December 2019 and reported and declareda pandemic by March 2020 (Murphy, 2022). Over 2.5 million people died due to this pandemic by the 1st of March 2020. Control and prevention of COVID-19 occurred through propel unprecedented collaborative effort including acceleration of the development of vaccines (Gubernot et al., 2021).Worldwide healthcare systems are being under unprecedented stress by the coronavirus (COVID-19) pandemic, with the UK's National Health Service (NHS) facing the largest challenge in its 70-year history (Hunter, 2020 cited in Dockerill et al., 2021). Over 125,000 deaths linked to COVID-19 have been reported in the UK because of therapid expansion of the disease (Public Health England, 2020 cited in Dockerill et al., 2021). Following the initial wave of COVID-19 infections, the NHS activity resumedbut was modified underguidelines designed to minimise patient interaction with healthcare providers and lower the risk of transmission through aerosol-generating procedures (NHS, 2020 cited in Dockerill et al., 2021).

COVID-19 has proved a high rate of infections among individuals of age 50 years or older, while the most vibrant population as symptomatic identifiers is between 18 to 49 years old, respectively(Murphy, 2022). SARS-Cov-2 is composed of four structural embedded proteins supporting its ineffectual elements. The four structural proteins are Spike (S), envelope (E), nucleocapsid (N), and protein (P) as well. A coronavirus disease infection is typically occurred due to the entering of the droplet from the infected individual's body and binds on the cell surface of the internal body with Angiotensin Converting Enzyme 2(ACE2) (Murphy,2022). To further investigate the role of ACE2, Perrotta et al. (2020 cited in Murphy, 20pointsoint out that the ACE2 is fundamentally proven by the type I and

II of the alveolar epithelial cells in the lungs. The protruding appearance of SARS-CoV-2 is highly prominent in the heart and lungs, while it has deliberatively effects on other parts and organs of the body (Murphy, 2022).

According to Basu-Ray and Soos (2020), people without cardiovascular illness, and those with chronic cardiac disorders or cardiac involvement have a greater mortality rate.Less cardiac patients have visited clinics or hospitals during this COVID-19 outbreak out of fear of getting the virus. Contrarily, cardiac patients, regardless of SARS-CoV-2 infection, require timely assessment and therapy. Current is especially true during this epidemic as the workforce and resources are frequently jeopardised(Basu-Ray and Soos, 2020).

When someone becomes infected with COVID-19 then itsprimary symptoms include cough, fever, and sore throat and are associated with further gastrointestinal indications like vomiting, diarrhoea, and nausea. Moreover, pneumonia, acute respiratory distress syndrome (ARDS) as well as septic shockare declared as the severity of the disease (Zaim et al, 2020 cited in Murphy, 2022).

Trends and patterns of CVD during COVID-19

Thus far, trends and patterns of the mortality rate of cardiovascular patients identified during the COVID-19 pandemic through direct and indirect infection in health care. A comprehensive study was done by Banerjee et al. (2021) on the weekly and monthly trend basis of CVD patients during the COVID-19 pandemic in England. Firstly, the weekly trend marked a rise in the number of patient death from 3rd January 2020 to 15 May 2020 by the figures 1631 and 1684 by level up and down respectively. Secondly, the monthly referral data and trend of CVD mortality and morbidity rate start from 0 figure on 1 0ctober 2020 and rose to high 2095 and 27510 on 1st April and 1st May respectively (Banerjee et al., 2021). Further statistics revealed that a total of 46321 reported as CVD patients out of 207596 during COVID-19, and the mortality rate was 48.7% (hospital registered) as compared to the national report that is 23.1% (Cordero et al., 2021).

Further analysis of data reveals that the mortality rate in CVD patients of elder age represents as highest rate (13.2%) as compared to CVD patients with other associated risk factors such as 9.2% diabetes, and 8.4% hypertension (HTN) respectively, according to the initial report in China (2020) during COVID 19 (Ganatra et al., 2020). Therefore, the patient reported previous cardiovascular risk factors, as well as cardiovascular disease, are more prone to contact with COVID-19.

Turning now to the statistical annual report done by the World Health Organisation (2021) on CVDs critically analysed and announced as the leading cause of death worldwide. In 2019, 17.9 million individuals died due to CVDs. Out of which 32% represented a global death and 85% due to heart attack and stroke as well. Additionally, out of 17 million premature deaths, 32 per cent of the patient died due to CVDs (WHO, 2021).

Frequently related complaints in patients with comorbidities like COVID-19 and cardiovascular disease are hypertension or myocardial attack or injury in association with sepsis. Moreover, a patient having comorbidities is vulnerable to primary as well as secondary viral infections due to a low level of immunity (Murphy, 2022). Furthermore, by the collaborative effort of scientists and the Food and Drug Administration (FDA) United States (US), vaccines against COVID-19 havebeen introduced to minimise the risk of spread and infection (Gubernot et al., 2021).

Subsequently, from the year 2019 to now (2022), coronavirus has an immense effect on patients especially having cardiovascular diseases. To explore the systematic approach and mechanisms of CVD complications, research has been conducted during COVID-19. Key factors including CVDindividuals' experience during COVID 19 need to be figured out (Meyer et al., 2022). Hence, the patient having CVD and COVID-19 respectively was declared as a 4-fold elevated risk of death (Cordero et al., 2021). Furthermore,specific key themes of pandemic strategies in the implementation of unrivalled social distancing analyse and use of personal protective equipment (PPE) to minimise or control the risk of spread of COVID-19 should be advised and implemented in a theoretical framework (Hwang et al., 2020). The key concept and underpinned theory about the individual's

experience with CVD were analysed during the COVID-19 pandemicand critically evaluated by the work done by Hanna et al. (2021) who said that the psychological, socio-economical, and physical ability of patients delivered on the care framework by the central approach of health and social care practitioner along with other staff. Additionally, for CVD patient's care and support, a comprehensive study was conductedand critically reviewed by Veerapen and Mckeown (2021), during the COVID-19 pandemic who evaluated the delivery skills of health care professionals with the help of recommended adaptation, support, and training.

According to Basu-Ray and Soos (2020), by global trends in cardiac illnesses at the time.An Italian case series evaluated the outcomes of 1,591 critically ill COVID-19 patients hospitalised in the intensive care unit. Cardiovascular problems affected 21% of these individuals; in countries other than China, its prevalence is much higher. On March 02 and April 01, 2020, 1150 patients with COVID-19 were taken to two hospitals for research from New York; 257 of them were in serious condition. Among these, 82% had at least one chronic illness, with hypertension (63%) and diabetes (36%), obesity (46%), and cardiovascular disease (19%) being the most prevalent. A comprehensive case series of 5700 COVID-19 patients hospitalised in 12 hospitals across New York revealed that there were 57% cases of hypertension, 34% cases of diabetes, and 11% cases of coronary artery disease(Basu-Ray and Soos, 2020).

To determine the role of person-centred care provided by healthcare professionals, and their impact due to the pandemic involving Cardiopulmonary resuscitation (CPR) treatment, which is a highly advisable treatment for cardiac patients. But in COVID-19, CPR is restricted due to direct contact with the patient through airway management. Hence, hospital policies required full personal protective equipment (PPE) according to American Heart Association guidelines while delivering CPR because it includes, ventilation, chest compressions, and drug delivery therapy as well due to its complex intervention (Aldabagh et al., 2021). According to new guidelines updated during COVID-19 stated that always place a towel or piece of cloth on the mouth and nose of the patient before performing CPR and continue exhaustion before defibrillation starts, which results in a lower risk of infection (St John Ambulance, 2021).

To prevent cross infection, all medical personnel should wear the appropriate PPE, which includes gloves, protective gear, Respirators face mask, safety caps, and goggles or protective screens. Only individuals with a normal body temperature are allowed in the waiting area once the patient's temperature has been taken. In the waiting room, patients should be seated at least one metre apart. The "one physician, one client, and one consultation room" rule should be strictly followed throughout the consultation, and attendants are not permitted. Use surgical masks and maintain a safe distance from patients and their loved ones. Since the medical team performing ECGs or any other unobtrusive scanning is near patients, they should be adequately protected.COVID-19 screening should be performed immediately on all patients(Shaheen et al., 2020).

Furthermore, Cath lab management (a catheter tube is used to enter the heart to locate any anomalies or heart malfunction) of cardiac patients is also influenced by the strict sop of COVID-19 by reducing the number of time people spend in waiting areas before and after procedures. While they wait, all patients should wear surgical masks. Before entering the lab, all patients are questioned about their respiratory problems, fever, and close contacts. Moreover, In a container designated for biomedical waste, dispose of all materials that were used throughout the process. The container should then be sealed. Throughout the transit towards the wards or referral centre, service users should wear a surgical mask, as must the orderly or doctor (Shaheen et al., 2020) (See Appendix D).

Existing Literature:

The current research work has adopted contemporary literature which is classified into two main categories:

1. Reported possible interrelation between cardiovascular diseases and COVID-19.

2. Proposed experience of individuals with cardiovascular disease during the COVID-19 pandemic.

From 2020 to now, more, and more descriptive research work has been done to discover COVID-19 and its impact on individuals' life. The earliest scoping review study regarding the CVD individual and their experiences as well as changes in lifestyle during the pandemic period of COVID-19 was found in 2020. Additionally, more literature has been found on the minimal aspect of COVID-19 along with CVD but not as generalised to be specific. A minimal number of studies have been found to explore the individual's experience during the pandemic period along with associated disease (CVD). This piece of research work, thus, will aim to fill up a gap in the existing literature about COVID-19 and CVD.

Rationale and Objectives:

The rationale of this study is to figure out the experience of individuals with cardiovascular disease during the pandemic period of COVID-19 from pre-lock down to post-lock down scenarios. The secondary purpose of this study is to figure out the risk factors associated with a correlation between CVD and COVID-19, respectively. Further, this piece of research aims to figure out the possible control and improvement to practice COVID-19 and the behaviour of individuals with cardiovascular disease. While the experience of incidence, distribution and control of COVID-19 infection in cardio patients willbe analysed from a critical point of view.

Methodology and Methods

Research Design:

This work involved conducting a scoping review to consolidate the knowledge and information regarding existing kinds of literature.

<u>The rationale for scoping review:</u>

A scoping review strategy allows the researcher to identify the types of literature to focus on and scan to address the given literature questions. Additionally, scoping review study emphasized the two components approach in overall research work. Firstly, a 'Strategy plan' to also figure out the literature review and quality. Secondly, 'Implementing that strategies used to search for literature, critique it, and draw out useful information and knowledge (Aveyard, 2018). Thus, the goal of this review is to synthesize the past pieces of literature in a different context about COVID-19 and cardiovascular disease interactions. Moreover, a scoping review is the most suitable way to gather information regarding topic key terms (COVID-19 and cardiovascular diseases) in a minimal period for which given information has been available. Furthermore, the notable aim of this review is to consolidate the maximum amount of existing knowledge about the literature questions to fulfil more understanding and knowledge in the form of new literature.

Thus, critically analysed and explored literature reviews addressed the existing literature gaps and identified the selected literature's overall themes.

Methodology

Secondary research in the form of quantitative research methods was conducted to correlate and represent existing works of literature in a new format. Quantitative methods used narratives which are integrated into this research work and start from theories, hypotheses, models, data, and end at estimated parameters. Subsequently, for the sake of clarity of data collection in the quantitative research method, corresponding measures and parameters have been formulated (Zyphur and Pierides, 2017). Further, data has been analysed on the quality of literature (Brunsdon, 2016).

Moreover, academic books, articles, and academic journals include Cambridge journals, sage journals, oxford journals, springer online journals, pro Quest journal, Royal College of the nursing journal, EBSCO books, Google scholar, Wiley online library, Discover@ Bolton library, PubMed Central, Taylor, and Francis online, BioMed Central open access, Consumer health database, and public library of science, considered to attain the overall goal and objectives of research work. Hence, to accomplish the review of literature through the above descriptive journals and book cites, Library based research has been considered and accomplished.

Library-based research

A database, volume, and relevant knowledge and information collected by one person and re-assembled in the catalogue in the shape of new documentation, literature as well as a journal by someone else are known as 'Library based Research.' The less expensive and time-consuming element of library-based research made it more consequence and innovative in research work. Moreover, secondary research contributed considerable time to this research work due to restrictive elements of conducting empirical research (Stewart and Kamins, 1993). Statistical analysis of previously published data on health and social care services regarding COVID-19 and cardiovascular disease individuals has been critically analysed and observed to accomplish the research gap and data collection step (Bryman, 1988).

Research Philosophy

Systematic views and premise related to the advancement of knowledge and information in research is known as 'Research Philosophy' (Saunders et al., 2009). Properly organised questions and answers have been considered and embarked on a way to figure out relevant information in each piece of work.

Further, Epistemological and Ontological approaches have been acknowledged. Term ontology is referred to as 'to undertake the reality of nature, either true or false.' Two forms of ontological approach have been considered to shape the overall methodology of research design. The first is, 'The pure philosophical ontology approach and the second one is 'Applied scientific ontology.' Discipline and domain are the two key figures which differentiated both ontological approaches throughout research work. Ontology as a discipline is considered to determine the reality as well as the concept of existing nature (Jacquette, 2002). While the domain ontology considered the result drawn out by the disciplinary ontological method.This dissertation states that ontology should be used to determine the experiences of people with cardiovascular disorders during the COVID-19 pandemic. While epistemology is dealing with all facets of the reliability, range, and processes of learning, such as a) what qualifies as a particular claim; b) how knowledge may be produced or gained; and c) how the degree of its generalisability can be evaluated(Moon and Blackman, 2017). Thus, an ontology approach is considered as a wider perspective to draw the shape and overall existing knowledge and literature to complete the methodology step of the dissertation. While epistemology method has acknowledged reviewing and analysing the existing kinds of literature, gathering information, scrutinizing the communication method, and re-research the data. Subsequently, the strength and limitations of research choice (library-based research) have been critically described and linked throughout according to academic values (Saunders et al., 2009).

Moreover, key concepts of ontology in terms of realism and epistemology in terms of positivism were arbitrarily chosen to acknowledge the summarised aims and objectives of a research paper. Pring (2015) described positivism that, 'A systematic study expressed as a philosophical system which includes openly, true, and clear monitoring survey.' The behaviour and policy of positivism are adopted chronologically in this piece of work (Pring, 2004). The observational pattern of human nature endorsed the positivism method at a fast pace to push out as much information as possible (Bruce et al., 2018). Overall, the adopted method (positivism) provided reasonable consistent evidence of an association between validity and clarification of information gained by the selected paper. Taken together, empirical verification has been drawn with the help of a positive approach (Bryman, 1988).

Additionally, a philosophical system in the form of 'Realism' is used to distinguish the several phases and reality of a piece of work in the human world and inspect a clear starting point along with the underlying cause (Taylor, 2018).A philosophical system is utilised, for instance, to determine how the health and status of cardiac patients change during the COVID-19 pandemic.Hence, the realism method is noted as an independent piece of work that deals with the two distinct figures of human research philosophy whether they may be true or false. Especially, when

scrutinizing and reviewing the central idea of literature (Taylor, 2018). Given the circumstances, both ontological and epistemological approaches best fit my piece of work based on the given consequences: objective nature of research, no human conflict or involvement, and independent form of study (Pring, 2004).

Methods

To figure out the gap in the literature and observational knowledge, the inductive approach was adopted to observe the given piece of work and conclude the final judgment. The inductive approach involved four steps to formulate a theory from the existing knowledge. Those steps also include observational knowledge, pattern, hypothesis, and theory. Moreover, the bottom-up approach along with the insider study pattern has been perceived in overall research work (Saunders et al., 2009).

Eligibility criteria

There were various requirements for inclusion and exclusion criteria of research work. Inclusive criteria are designed to precede the literature search with inclusive key figures and terms. The exclusive criterion is the plan designed to change the omitted elements when doing the research work (Jasper and Ansted, 2008). However, both criteria were arbitrarily selected and composed in the table below, to determine and accomplish the overall aims and objectives along with research design questions.

Furthermore, this inclusion and exclusion criterion was applied throughout the manual selection of the thesis as well as the abstract evaluation. Due to the removal of unnecessary information, the review was able to be more focused and critically reviewed.

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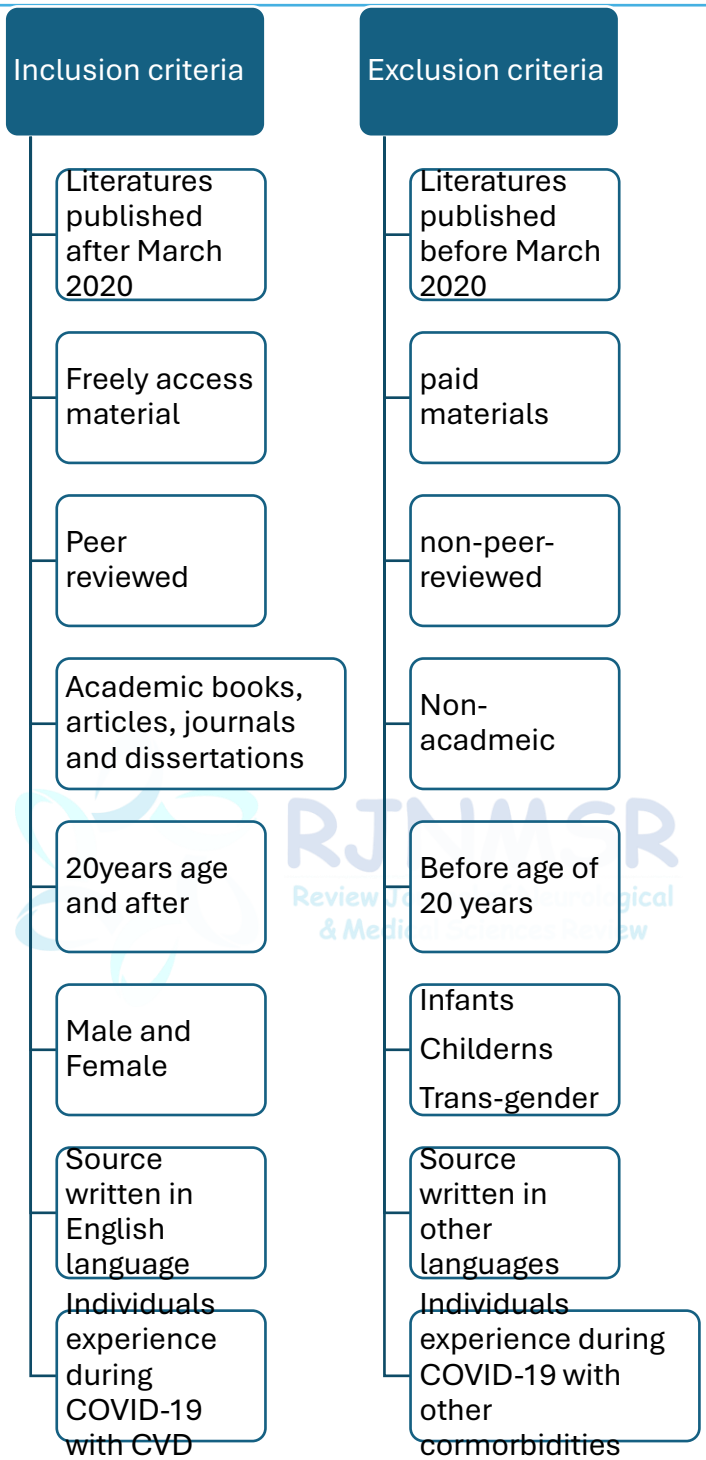

Table 1: Inclusion and Exclusion criteria.

Search strategies

Two distinct searches were conducted following the two major categories of existing literature mentioned in the review's opening. To address the more theoretical links suggested, the initial search term started with "COVID-19 AND Cardiovascular Diseases," followed by the keywords found in Table 2.

The search terms are listed in Table 2. The keywords were used to narrow the search results along to determine whether the papers found were pertinent and precise enough to deal with Cardiovascular disease and COVID-19. Hence, from July 2022 onwards, searches were scanned in PubMed, Discover@ Bolton database, Google scholar, and Europe PMC using the terms listed in Table 2.

Table 2: Search key terms for selecting and filtering the literature:

Cardiovascular Disease	Coronavirus COVID-19	Treatments	Outcomes
Coronary heart Disease	Epidemic (Before pandemic)	Self-management	Morbidity
Cerebrovascular Disease	Pandemic	Tele-medicine	Mortality
Peripheral arterial Disease	SARS-COV-2	Virtual appointments	Diagnosis
Rheumatic heart Disease	Long term	Social distancing	
Deep vein thrombosis and Pulmonary embolism	Post COVID-19 syndrome	Isolation	
High blood Pressure	Viral infection	PPE (Personal protective equipment) usage	
Abnormal heart Rhythms			
Angina			
Arterial fibrillation			

Search 1:
"COVID-19 AND Cardiovascular Disease AND (Coronary heart Disease OR cerebrovascular disease OR peripheral arterial disease OR angina OR high blood pressure OR comorbidities) AND (Epidemic AND Pandemic OR SARS-COV-2 OR Long term OR post-COVID syndrome OR viral infection) AND (Self-managements OR virtual appointments OR telemedicine OR isolation AND social distancing OR PPE usage) AND (mortality OR morbidity OR Diagnosis)."

Search 2:
"SARS-COV-2 AND Heart diseases AND (high cholesterol/blood pressure OR diabetes with Cardiovascular disease OR deep vein thrombosis OR pulmonary embolism OR angina)."

Selection process
Three steps made up the selection procedure for this scoping review.

1. Initial search result: Based on the date of publication, full free access, article type, availability as well as duplication from the previous search.
2. Abstract review: Based on the verification of peer-reviewed or scholarly review.
3. Final selection: Relevant and focused on COVID-19 and cardiovascular disease.

Results
There were a total of 1951 results from the two searches on the Discover@ Bolton database. After filtering and excluding the literature by date before March 2020, 1942 results came out. A total of 1424 results were obtained via further filtering of literature that was not scholarly, peer-reviewed,

and not made available on free/ full open access online. Further, 1066 results were obtained based on content type and discipline as well. Journal articles in the fields of medicine and public health are among the content types.The largest exclusion was obtained by filtering the results by subject term (Table 3), which reduced the results from 1066 to 183.Additional database and language-based filtering yielded 40 results (Table 4).Following that, the remaining searches were evaluated using a manual filtering procedure. The thesis author read the 40 findings' abstracts and filtered them appropriately based on the exclusion criteria's quality rating. This step's exclusion of the literature was primarily motivated by the fact that it was either too particular or out of alignment with the review's goals.In keeping with the goals of the review, the selection process gave generalizability the utmost priority while analysing a thorough overview of the subject. 17 papers in all were chosen in compliance with the requirements for this systematic review.A further search on PubMed was conducted to find a systematic review, and 28 items were found out of 15228 by search term based (Table 5). Thus, a total of 45 results were manually analysed and critically examined to fulfil the overall study aims and goals in the form of a thematic view that will be described in the literature review, but the filtration of literature was carried out throughout the literature review process.

Discover @Bolton searches:

Table 3: The literature selection process yielded results by subject terms.

Subject Term	Search result
COVID-19	196 and 461
Coronavirus	583
Sars-COV-2	477
Cardiovascular system and cardiology	448
Pandemic	413
Severe acute respiratory syndrome	317 and 114
Cardiac and cardiovascular system	258
Cardiovascular disease	253 and 112
Hypertension	194
Cardiac patient	56
COVID-19 Mortality	4

Table 4: The literature search yielded results by Database.

Database	Search result
PubMed	25
Wiley Online Library all journal	6
PubMed Central	38

PubMed Search:

Table 5: The literature search process yielded 28 results.

Search term	Type	Results
Text availability	Free access	15228
Period	Date and Year	17782
Article type	Systematic review	575
Species	Human	476
Language	English	475
Sex	Male and Female	155
Age	Age 20+ years	97

Article	Associated data	28

Additional searches were done using the terms "COVID vaccination and CVD," yielding 154 first hits. The search term was reduced to 131 results when it was peer-reviewed and scholarly. 38 papers were obtained once the study works were once again cleaned up using the "English" language option. To determine the potential queries and answers in the literature, a manual study and filtration process were used to analyse those papers.

In the meantime, a variety of types of literature were also searched for using the terms physical activity and cardiac rehabilitation; the initial results returned 98. A further search with the phrases "public health," "physical activity," "physical fitness," "covid-19," and "cardiology" yielded 8 results. On scholarly and peer-reviewed selection, 6 additional papers were acquired. To conduct the literature review, a manual technique was used.

Thus, a total of 29 pieces of literature are included in this dissertation work.

Literature Review

This chapter presents a review of literature related to the individual's experience with cardiovascular disease (CVD) during the pandemic of coronavirus (COVID-19). Further, risk factors associated with covid-19 and CVD and exacerbated response to patient health was critically analysed and reported. Finally, the literature related to lifestyle interventions in males and females is reviewed. After that, a thematic approach is used to present an overview of the thesis and research program.

Theme 1

COVID-19 and CVD

Worldwide, the coronavirus disease 2019 (COVID-19) pandemic has impacted people and seriously threatens global health. The World Health Organization (WHO) first used the term "COVID-19" to refer to the coronavirus disease of 2019 in February 2020. Over 1,500,000 cases with lab confirmation had been recorded in 184 nations as of April 9th, 2020. Unfortunately, COVID-19 has caused almost 90,000 fatalities(Burrage, 2021).

On the other side, cardiovascular disease continues to be the primary cause of morbidity and mortality (especially coronary artery disease and ischemic heart disease) worldwide. According to early data from China, older patients, and those with CVD (13.2%) had a higher COVID-19 death rate among hospitalised patients than those with other comorbidities. Additionally, it was substantially greater for individuals with CV risk factors such as diabetes (9.2%) and hypertension (8.4%) compared to roughly 1% for patients without these comorbidities(Ganatra et al., 2020). According to Engin et al. (2021), the current COVID-19 epidemic is unlike any other healthcare emergency in human history.An aortic dissection may have developed because of the inflammatory process brought on by COVID-19. Therefore, it is not yet feasible to fully forecast the issues that COVID-19 may cause. Hence, further research should be needed to fill the literature gap and identified the issues caused by COVID-19.

Outpatient management of the cardiac patient during COVID-19 is highly impacted because of restraint factors and elements of standard operating procedures (SOP).Only those who have a normal temperature should be allowed into the waiting area after the temperature of each patient has been taken. Over a meter should separate each patient in the waiting room. With strict adherence to "one physician, one client, and one consultation room," no attendants are permitted during the consultation when the number calling method is used. Wear surgical masks and preserve your distance from patients and their families.

Being near patients while doing an ECG or another noninvasive imaging procedure requires the medical team to be well protected.

Subsequently, worldwide healthcare systems are under unprecedented stress because of the coronavirus (COVID-19) pandemic, with the UK's National Health Service (NHS) facing the most difficult situation in its 70-year history. According to Dockerill et al. (2021), over 125,000 deaths linked to COVID-19 have been reported in the

UK because of the disease's rapid spread throughout the country. Due to continuous clinical routine tests, Stress echocardiography is essential for the delivery of proper health care service to CVD patients during COVID-19. The stress test is minimised during the 1st wave of COVID-19 and as a result, people faced difficulties in stabilising their cardiac conditions. Hence, after 1st wave of pandemic stress echocardiography has administered by NHS under the rules and regulations of COVID-19 (Dockerill et al., 2021).

Theme 2

Myocardial injury (MI) during COVID-19

Cardiovascular injury is the most often reported acute CV symptom, and it can be detected by raised levels of high-sensitivity troponin I, troponin T, and creatinine kinase. High-sensitivity troponin I was considerably elevated in more than half of fatal COVID-19 cases (Januzzi, 2020 cited in Mahenthiran, Mahenthiran and Mahenthiran, 2020).

The beta-coronaviruses that cause Middle East respiratory illness (MERS) and severe acute respiratory syndrome (SARS) share the same subtype as SARS-CoV-2 (MERS).Acute coronary syndrome and myocardial infarction are just two of the cardiovascular conditions that SARS-CoV-2 may have brought on. SARS-CoV-2 appears to share pathogenesis with the coronaviruses that cause MERS and SARS based on reports of cardiac involvement (Singh et al., 2020). Moreover, in the analysis done by Singh et al. (2020) on 6 studies, patients who needed to be admitted to an intensive care unit (ICU) due to severe illness had an incidence of acute cardiac damage due to COVID-19 that was almost 13 times higher than patients who did not need an ICU admission.Similarly, with an incidence of 8% to 12% on average, Zhou et al., (2020 cited in Singh et al., 2020) identified acute myocardial damage as the most frequent cardiovascular consequence of COVID-19.Another typical CV symptom of COVID-19 infection is cardiac arrhythmia. In Wuhan, China, a preliminary patient cohort study found that arrhythmia incidence was 16.7% overall but jumped to 44% in ICU patients (Wang et al., 2020 cited in Mahenthiran, Mahenthiran and Mahenthiran, 2020).

Considering this, a systemic inflammatory response that was enhanced during COVID-19 may increase the risk of cardiovascular disease (CVD) in future COVID-19 survivors. Once SARS-CoV-2 has invaded the host cell, the body defends itself by triggering an inflammatory response that boosts the production of proinflammatory cytokines. Further, increased cytokine level leads to exponential growth and inflammation and results in a severe immune system response that targets the body, which can cause ARDS and multiple organ failure. Thus, the development of the systemic inflammatory response and the pathophysiology of the cytokine is likely responsible for the myocardial injury that occurs during illness with COVID-19 (Heckel, 2021). Moreover, Saririan et al., (2021)also highlighted instead of several studies' limitations that COVID-19 and coronavirus infections lead to stiffing of arteries and result in myocardial injury. According to Crimmins and Beltran-Sanchez, (2010), the changes analysed in the incidence of and survival following myocardial infarction (MI) can give some insight into whether mortality is decreasing because fewer people are having heart attacks, a relatively well-defined cardiovascular event, or whether survival is rising among those who do.

Myocarditis also influenced the lifestyle of athletes during the pandemic period. The pathophysiology of sudden cardiac death (SCD) in athletes is heavily influenced by myocarditis. In athletes with myocarditis, physical activity is likely a trigger for risky arrhythmias and may increase the risk of myocardial injury(Modica et al., 2022). Additionally, on the prevalence of cardiac failure in COVID-19, little information is available. According to studies from Wuhan City, heart failure was the cause of death for 50% of COVID-19 patients (HF)(Zhou et al., 2020 cited in Mahenthiran, Mahenthiran and Mahenthiran, 2020).

Moreover, unemployment during the pandemic of COVID-19 increase the risk of myocardial injury due to significant emotional stress before and after the event of contact with COVID-19. MI can also be caused, but only rarely, by spontaneous

coronary artery dissection (SCAD).Additionally, it has been demonstrated that unemployment causes significant stress in SCAD patients and is linked to worse cardiac events both during hospitalisation and in thefollowing days.Therefore, in addition to standard medical care, short- and long-term therapy for these patients should involve psychosocial interventions to address the root causes of their emotional stressors, especially in disorders like SCAD that have a high risk of recurrence with continued stressors(Roche et al., 2022).

Hence, the above-cited literature successfully administered the intensity of myocardial injury in patients during COVID-19.

Theme 3

Risk factors associated with COVID19 vaccination

In the battle against coronavirus sickness in 2019, vaccines are our first line of defence (COVID-19). There have been many minor side effects documented, which are cautiously treated apart from major that is cardiac arrest or heart attack (Aneeqa et al., 2022). A case study of a 64-year-old male was reported after being administered 2nd dose of COVID-19 vaccination (Moderna) with a history of heart disease. Shortness of breath and pain in the chest started after one week of the dose. Although the patient was 1st in which that outcome was reported after vaccination. As more people receive the COVID-19 mRNA vaccine, a wider range and greater number of side effects are known (Aneeqa et al., 2022). Arguably, patients with CVD experience thromboembolism with Oxford-AstraZeneca and Johnson and Johnson vaccine(Rosano et al., 2021).

All COVID-19 vaccinations currently on the market are injected intramuscularly. All patients' most frequent complaints include pain following an injection, fatigue, headache, muscle pain, chills, or a moderate fever. The timing of these adverse effects varies depending on the vaccine type; they are anticipated to be transient, lasting roughly 24–48 hours, and often respond to paracetamol and increased fluid intake. Importantly, non-steroidal anti-inflammatory drugs (NSAIDs) should be avoided in patients with HF due to their potential adverse effects, including the possibility of circulatory decompensation. Paracetamol is still the preferred antipyretic medication in this population. These vaccines are positioned as very safe preventive measures due to the extremely low risk of serious allergic reactions, including anaphylactic reactions(Rosano et al., 2021).

Subsequently, female recipients of the COVID-19 immunisation also had an elevated risk of myocarditis or myopericarditis. However, a subsequent study found that female participants and younger age groups had a generally low absolute rate of myocarditis or myopericarditis cases following SARS-CoV-2 mRNA immunisation. It further emphasised that most of the myocarditis or myopericarditis clinical outcomes are moderate, supporting the general safety of SARS-CoV-2 mRNA vaccines (Modica et al., 2022).

Due to the small number of research, initial assessments of thrombotic events following vaccination were constrained (Houghton et al., 2022). The study done by (Houghton et al., 2022)is constrained by the observational methodology usedand the potential loss of outcome measurement during pre- or post-vaccination intervals. Sensitivity analyses by geographic regions were carried out to show comparable results to assess the potential impact of insufficient event ascertainment. Additionally, due to limited data on the thematic review of risk factors after COVID-19 vaccination, hence, more studies should be needed to critically explore the post covid vaccination among individuals with CVD.

To summarise, the COVID-19 vaccination ought to be administered to every patient with HF. The benefits of preventing symptomatic SARS-CoV-2 infection and associated major non-fatal and fatal sequelae outweigh the risks of adverse effects, which are often moderate and transient, and severe problems, which are incredibly uncommon. As soon as their clinical status is stable if individuals with HF will get the SARS-CoV-2 vaccine.Given the exceedingly low number of cases and unproven causative association, as well as the significant global survival gains brought on by this vaccine, it is important to proceed with

caution when interpreting these data(Rosano et al., 2021).

Theme 4

Physical activity and Social distancing

Any movement made by the skeletal muscles that need the body to expend energy is physical activity(Heckel, 2021).Physical activity is commonly recognised to have a beneficial effect on people's physical and mental welfare. However, the enforced lockdown/restriction tactics, which include having only a short window of time each day to exercise outdoors, may have decreased a person's opportunity to be physically active while also creating an environment in which sedentary behaviour is more prevalent. Furthermore, it is generally known that these have detrimental consequences on both health and quality of life(Kite et al., 2021). It is a lifestyle factor that can be changed, and by doing so, it may help those recuperating from COVID-19's cardiovascular effects by reducing inflammation and arterial stiffness.More precisely, consistent participation in moderate-to-vigorous physical activity (MVPA) has been proven to minimise the risk of coronary heart disease, myocardial infarction, and stroke.Additionally, those recuperating from COVID-19 may have diminished physical function, which might result in less physical activity (Heckel, 2021).

Subsequently, social distancing is the phrase used to describe any sort of decreased interpersonal contact. Social distance can be divided into two categories: interpersonal and public.Public social distance refers to a set of regulations put in place to ensure that large groups of people are not permitted during the COVID-19 outbreak. These include, but are not limited to, travel bans, closures of workplaces and schools, as well as the closure of arenas, theatres, stadiums, and shopping malls. While personal social distance refers to the steps people take to limit their interaction with others. These precautions include staying home, avoiding busy areas, forgoing handshakes, and hugs, and avoiding unnecessary travel.To stop the spread of COVID-19, several health authorities throughout the world are currently encouraging individuals and the public to distance themselves from one another. Additionally, the public must firmly enforce and adhere to the social distance for it to be effective as a mitigation strategy against the spread of COVID-19. Additionally, in COVID-19 pandemic hotspot areas, aged persons, especially those with underlying medical issues, should closely follow all social segregation measures(Ayenigbara et al., 2020).

Importantly, about the physical activity and social distancing during COVID-19, the patients having heart disease assume to be more obese than usual and as a result, arterial inflammation and stiffness occurred. It is challenging to distinguish whether changes in inflammation are primarily brought on by increased physical activity or changes in body composition because many studies showed that the relationship between levels of physical activity and inflammation aredocumented improvements in body composition(Gando et al., 2010).This research indicates that increasing physical activity levels may be a cardioprotective lifestyle adjustment that may have significant advantages for controlling future CVD risk in those recovering from COVID-19, together with reductions in inflammation (Heckle, 2021). Thus, a wrist-worn accelerometer was used to capture daily minutes of physical activity and the total number of steps taken throughout the day to quantify physical activity (Frith et al., 2021). Additionally, Due to the suspension of one-on-one consultations during COVID-19, patients used an immovable tape measure to measure their height (in centimetres) and waist circumference at home. The height of the navel was the designated measurement point for the waist circumference of the patients. Using the automated blood pressure machine that was given, resting blood pressure and heart rate were assessed. Before measuring the resting heart rate and blood pressure of the patients, they were advised to sit for at least five minutes. We used the given scales to measure body mass (Frith et al., 2021).

Physical activity is frequently employed in the treatment of CVDs such as chronic heart failure (CHF) and coronary artery disease due to the positive effects of being active (CAD).The care of persons with cardiovascular illness and chronic pulmonary disease is fundamentally based on cardiopulmonary rehabilitation. The foundation

of these rehabilitation programs is a supervised, individually tailored exercise regimen (aerobic exercises, muscle strengthening, and breathing exercises). Beyond the benefit of exercise rehabilitation on morbidity, pulmonary rehabilitation has also been shown to significantly improve symptoms, cardiorespiratory fitness, and quality of life(Besnier et al., 2022).Patients may undergo cardiac rehabilitation under these circumstances, which is a personalised program of exercise and education, to enhance their health, recover after surgery, or treat heart disease. The American Heart Association, the American College of Cardiology(Long et al., 2020 cited in Kirsch and Vitiello, 2022), and the European Society of Cardiology(Pelliccia et al., 2020 cited in Kirsch and Vitiello, 2022)all suggest cardiac rehabilitation. Studies have shown that it can enhance patients' health and quality of life. Studies have demonstrated its capacity to lower the chance of death. Thus, after COVID-19 infection, brain and cardiopulmonary functioning are usually compromised by affected individuals. Possible contributing factors to the overall symptomatology include physical deconditioning and decreased exercise tolerance(Besnier et al., 2022). Scientific/health experts have been outspoken about the need for the general population to exercise regularly during the lockdown/restriction measures, and this has been reflected in global government recommendations/policies. This is especially true for cardiac patients(Kite et al., 2021).

In addition to the fact that COVID-19 has an impact on CVD patients who are unable to effectively complete their cardiac rehabilitation programs, it has also changed the opportunities for the public and athletes to engage in physical activity due to its intrinsic limitations, so patients and professionals are encouraged to use mobile health device (Active+me) to ensure patient's safety (Kirsch and Vitiello, 2022).

Both patients and medical professionals accept Active+me. After the usage of Active+me, patients had improved abilities, knowledge, and confidence to manage their heart conditions. High-risk patients for cardiovascular events appeared to benefit the most. In the short term, increases in patient activation were linked to lower systolic blood pressure and higher levels of self-reported physical activity. Thus, to confirm the benefits of employing Active+me to enhance remotely delivered cardiac rehabilitation, additional large-scale controlled trials are required(Frith et al., 2021).

Many people's participation in physical activity has undoubtedly decreased because of the closure of gyms, indoor sports facilities, and leisure centres, as well as the suspension of recreational sports and travel limitations that apply to all but necessary travel. It's likely that the amount of leisure-time physical activity, particularly that which is intense, along with active transportation and daily activities, has reduced dramatically. Consequences include a higher risk of developing chronic diseases due to this new, less active way of living(Kite et al., 2021).

However, it is strongly urged that full adherence to the mitigating and preventive actions outlined above is necessary to achieve the desired objectives in the prevention, management, and control of the COVID-19 pandemic.

Theme 5

Associated factors with CVD during COVID-19

There is a wide range of clinical symptoms that COVID-19 might have such as, fever, cough, headache, vomiting, and diarrhea experienced by individuals with CVD. Additionally, thrombosis can happen even though respiratory symptoms are more common. In critically ill COVID-19 patients, thrombotic problems can reach up to 31%. (Klok et al., 2020 cited in Mahenthiran, Mahenthiran and Mahenthiran, 2020). Venous thromboembolism (VTE), pulmonary embolism, and other symptoms are present (PE).As a result, healthcare professionals should be informed of the potentially fatal thromboembolic events linked to COVID-19 so that fast, appropriate action can be taken to prevent dire consequences(Aly et al., 2021). Moreover, thromboembolism is experienced by CVD patients during COVID-19 due to respiratory illness whether it may be in-door or out-door patient setting (Kloosterboer et al., 2021).

Subsequently, heart failure could result from the uncommon but deadly disorder known as cardiomyopathy. Systolic dysfunction, diastolic

dysfunction, or both may be present in cardiomyopathy.Diastolic dysfunction causes rigid cardiomyopathy, which is connected to intraductal diseases, storage, or may be idiopathic. Systolic dysfunction causes endothelial dysfunction, which results in a prevalence of 1:2500 and is the third leading cause of cardiac arrest and the most common reason for heart transplantation (Singh et al., 2020).

According to Lavie et al., (2019 cited in Kirsch and Vitiello, 2022) that numerous factors contribute to cardiovascular diseases (CVDs), a sedentary lifestyle, and inadequate exercise are among the most significant. Lack of exercise causes metabolic problems by increasing cardiovascular morbidity, arterial stiffness, high-density lipoprotein (HDL) cholesterol content, mitochondrial dysfunction, and a decline in lipoprotein lipase activity. Therefore, sedentary activity increases the likelihood of having a CVD and hurts health (Tremblay et al., 2010 cited in Kirsch and Vitiello, 2022).

Subsequently, according to the study done by (Shah et al., 2022), shortness of breath and cough can be associated with the adverse effects of COVID-19 infection in CVD patients. Since the start of the pandemic situation, the cardiovascular problems of COVID-19 have resulted in millions of deaths due to a global health crisis. Cardiovascular function is most affected by COVID-19.Additionally, acute respiratory distress syndrome is brought on by it. So, the COVID-19 pandemic's widespread reporting of arrhythmias (and accompanying cardiovascular problems) justifies the creation of evidence-based treatment strategies to lower the frequency of cardiac mortality. Further research should be conducted to declare the pathophysiology of associated symptoms with CVD and COVID-19 infections.

Theme 6

Mobile Health

In attempting to prevent the covid-19 spread, face-to-face treatment and research have been discontinued. Due to the stringent social isolation imposed in reaction to the rise in COVID-19 cases, patients with cardiovascular conditions were unable to get the routine care they had previously relied on to control their heart rate and other related activities.Heart failure risk during a pandemic is increased by poor management and self-care. Hence, smartphone-based mobile health (mHealth) initiatives have demonstrated special potential in raising the level of self-care among these patients and subsequently enhancing the course of their condition.Mobile health's goals are to encourage patient-physician communication about care and reduce the likelihood of heart failure during COVID-19(Bakogiannis et al., 2021).

Telehealth services are essential and a great initiative to provide care, especially during times like the COVID-19 pandemic. Hence, the quality of self-care has increased with the use of mHealth. Overall, the above cite study depicted the greatest approach in the field of health and care service, especially for heart disease patients but more studies should be needed to analyse the long-term effects of mobile health.

Moreover, Hibbard et al., (2004 cited in Frith et al., 2021) stated that Active+me is designed to increase patient activation, aterm describing the knowledge, skill, and confidence apatient must manage their health. The medically approved telemetry device Active+me (ISO 13485:2016) features a completely customizable suite of lifestyle education (such as weight management) and behaviour change assistance, live fitness courses, physical activity, health monitoring tools, and medication diaries.The platform was developed based on the behavioural principles of cardiac patients during COVID-19.A healthcare provider, however, can choose which resources to offer to patients and when to do so. This comprises the approaches you employ while altering behaviour. When patients signed up for CR, Active+me was sent to them by mail.The gadgets came with an instruction manual and DVD that described how to set them up. Patients who used Active+me also received a body mass scale, an automated blood pressure monitor with heart rate monitoring, a pulse oximeter, and a physical activity tracker. All the gadgets were connected through Bluetooth to a smart device using a program that was downloaded from the Apple or Android app stores.Using information supplied from the patients' accessory devices to a personal computer terminal, healthcare experts kept in touch with the

patients throughout the program, tracked their progress toward accomplishing goals, and assessed their participation with Active+me (Frith et al., 2021).

Further work done by Diaz-Skeete et al. (2021) stated that heart failure (HF) outpatient consultations are being conducted remotely or over the phone during the COVID-19 epidemic. For instance, by shortening consultation times, an app that allows patients to share their medication lists with medical personnel beforehand could promote clinical efficiency. Apart from the use of the mHealth app, the efficiency and accuracy of the mobile app have strictly ensured proper care and support administration. Mobile apps operated on android or iPhone have subjective and objective quality user-friendly features to enhance overall functionality.

According to Heiney et al. (2020), mobile health apps during the pandemic period dramatically increase self-care maintenance and management in people with heart failure in African Americans. In patients with low reading, low health literacy, and little smartphone experience, a self-management mHealth app for heart failure is viable.Studies found that free Internet-based and virtual exercise programs may substitute in-person exercise options for healthy individuals in the ever-evolving digital environment for strength, endurance, and flexibility training (Ricci et al., 2020 cited in Kirsch and Vitiello, 2022). While some areas don't have internet facilities and patients are non-educated so they cannot learn how to use the-mobile health apps or devices. Sofurther investigation should examine the effectiveness of the Healthy Heart app in this susceptible demographic considering the clinically pertinent changes seen in this Healthy Heart app feasibility study.

Theme 7

Morbidity and Mortality of patients with HF during the COVID-19 pandemic

Fries, (1980 cited in Crimmins and Beltran-Sanchez, 2010) first proposed the concept of "Compression of Morbidity" thirty years ago, and it serves as a helpful forum for debating advancements in research on geriatric health trends.He predicted that a shorter morbid life span would go hand in hand with an increase in life expectancy. Fries thought that the same factors that led to a decline in mortality would also be associated with a decline in the incidence of chronic illness and a rise in the age at which illness first manifested itself (Fries, 2000, 2001, and 2002 cited in Crimmins and Beltran-Sanchez, 2010). Further, according to Gruenberg (1977 cited in Crimmins and Beltran-Sanchez, 2010), the rise in disease prevalence would counteract the drop in chronic disease-related mortality.

Furthermore, millions of people are dying because of the coronavirus (COVID-19) pandemic, and the growing incidence of non-communicable diseases (NCDs) is already having an impact on the health care system. On the other hand, the scientific community is heavily involved in research to determine the best ways to characterise the support and effort to restrict NCDs, including cardiovascular illnesses, by battling the virus and reducing its impact mainly (CVDs), which significantly increase the mortality toll globally.

Subsequently, Rosano et al. (2021) argue that by directly and indirectly increasing morbidity and mortality, the COVID-19 pandemic has dramatically changed the epidemiology of HF. Further research shows that, when HF patients become infected with SARS-CoV-2, their prognosis is incredibly bad, especially if they are highly symptomatic, at an advanced stage, and/or have circulatory decompensation. It is known, however, that patients with stable HF who exhibit fewer symptoms may experience a swift decline in their clinical status after contracting SARS-CoV-2. In addition, Banerjee et al., (2021) acknowledged that by using Kaplan-Meier analyses stratified by specific CVD and number of (non-CVD) comorbidities and scaling up from CALIBER (3.8 million people) to the entire population of England aged 30+, consisting of 35 407 313 people (using 2018 estimates of overall population size and mortality), we estimated incidence rates per 100 000 person-years and pre-COVID-19 1-year mortality risk for incident and prevalent CVD.Up until the middle of May 2020, non-COVID-19 and CVD-related fatalities in England and Wales rose in a similar pattern to total (including COVID-19) deaths(Banerjee et al., 2021)

Further work by Hanff et al. (2020) acknowledged that, although the reasons causing cardiovascular disease and other comorbidities are highly associated with COVID-19 yet underlying mechanisms are still unknown. These findings will be a crucial starting point for elucidating the contribution of COVID-19 infection to the morbidity and mortality of CVD patients. Additionally, racial disparities are seen in the greater COVID-19 cases and mortality rates among African Americans and Hispanics compared to European Americans, most likely because of their darker skin and lower vitamin D levels(Yancy, 2020; Yehic et al., 2019; Gindle et al., 2009 cited in Singh et al., 2022).

Well, it is interesting to think about compressing morbidity. People wish to live their entire lives in excellent health and pass away peacefully, free from pain, illness, and functional loss. Compression of morbidity, though, might be just as false as immortality. We don't seem to be advancing toward a society in which death is free from illness, loss of function, and incapacity (Crimmins and Beltran-Sanchez, 2010).

Theme 8

Lockdown during COVID-19

Due to quarantine measures put in place in many countries in response to the COVID-19 outbreak, there has been a decrease in the daily active behaviour of cardiac patients. Patients with heart failure (HF) took fewer steps per day while under quarantine. The number of daily steps dropped according to an individual's lifestyle and living in an apartment or with at least two other adults made the negative impact of quarantine on the daily step count even greater(Kirsch and Vitiello, 2022).

Arguably, the COVID-19 pandemic lockdown has undoubtedly had an impact on the sports world as well, forcing sportsmen to train at home. The result was a type of detraining for amateur or professional athletes who had stopped engaging in their usual levels of physical activity, resulting in a decline in oxygen level. Additionally, studies on detraining have noted an increase in maximum heart rate of 4% and a reduction in stroke volume of 10% (Coyle et al., 1984 cited in Kirsch and Vitiello, 2022). As a result of these modifications, the maximum oxygen delivery capacity is diminished and cardiac output is negatively impacted, and stopping your workout has an impact on your muscles as well (Martin et al., 1986 cited in Kirsch and Vitiello, 2022) And (Mujika et al., 2000 cited in Kirsch and Vitiello, 2022).

On contrary, advantages of home-based cardiac rehabilitation during lockdown include increased privacy, fewer transportation obstacles, greater patient independence, cheap cost, the ability to customise, and virus infection protection. Additionally, it has drawbacks including fewer in-person engagements, data security and privacy, a lack of legal standards, and a lack of social interaction (Scherrenberg et al., 2021 cited in Kirsch and Vitiello, 2022).Despite these potential drawbacks, it has been demonstrated that increased enrolment of HF patients in a distance cardiac rehabilitation program during the COVID-19 pandemic lowers the likelihood of emergency readmission. According to this finding, remote cardiac rehabilitation programs can be offered in place of traditional cardiac rehabilitation programs (Nakayama et al., 2020 cited in Kirsch and Vitiello, 2022).

Theme 9

Vitamin D

According to Chibuzor et al. (2020), Vitamin D, which is also known to help strengthen bones, regulates calcium levels.Recent research, however, points to the fact that it also has immunomodulatory and anti-inflammatory effects. As a potent epigenetic regulator of more than 2500 genes, vitamin D has an impact on several disorders. As a result, it is linked to catastrophic conditions like cancer, diabetes mellitus (DM), acute respiratory infections (ARIs), autoimmune diseases like multiple sclerosis, and, intriguingly, cardiovascular diseases (CVDs), which are the world's largest cause of non-communicable diseases-related death (Yin et al., 2014; Carlberg et al., 2019; Manson et al., 2019; Grant et al., 2020; Pittas et al., 2019; Martineau et al., 2019, and Hayes and Ntambi., 2020 cited in Singh et al., 2022). Additionally, based on seasonal variations, Mitri et al., 2011 and Kroll et al., 2015 cited in Singh et al. (2022), exhibit inverse relationships between vitamin D synthesis

and solar Ultraviolet B (UVB) doses.For instance, COVID-19 cases began in the winter in the northern areas, and in the summer, notably in Europe, both the number of cases and the death rate declined. However, in the later months of July and September, higher rates were observed in several European nations (Worldmeter, 2020).

Further, patients with CVDs, which affect their heart and blood vessels, as well as those with COVID-19 infections lack vitamin D, an essential nutrient. In a recent review, Latic N. and Erben RG. (2020) emphasised the importance of vitamin D for cardiovascular health and the link between vitamin D insufficiency and cardiac problems that affect one billion people worldwide.Although few reliable interventional studies demonstrate a link between vitamin D supplementation and improved cardiovascular health, most observational and ecological studies firmly support the cardiovascular preventive effect of vitamin D(Singh et al., 2022).

Well, beyond aberrant bone health, inadequate vitamin D is implicated as a risk and outcome predictor for several disorders. A necessary nutrient with the ability to serve both therapeutic and preventative purposes is vitamin D. Its application can be expanded to combat the two most lethal pandemics we currently face, COVID-19 (communicable), and CVDs (non-communicable) (Singh et al., 2022). Even though more studies are showing the epidemiologic, immunologic, and clinical links between vitamin D and several disorders, including COVID-19, more research is necessary to fully comprehend its use and implications for public health intervention.

Discussion

The purpose of this research was to explore the experiences of people with cardiovascular illness during the COVID-19 epidemic using a scoping method.The impact of COVID-19 limitations on active behaviour in patients with CVDs is one of the aspects discussed in the literature review chapter as well as gaps in the existing literature.The relationship between COVID-19 and cardiovascular disease patients and its effects on their lifestyle and health has been examined in a significant amount of literature that has undergone critical analysis. Thus, to fully implement the research plan, major gaps in the literature have been identified and discussed below.

People have been affected by the COVID-19 pandemic, which poses a major threat to world health. In February 2020, WHO first referred to the coronavirus disease of 2019 as "COVID-19." As of April 9th, 2020, 184 countries had reported more than 1,500,000 lab-confirmed cases. Unfortunately, COVID-19 has resulted in close to 90,000 deaths (Burrage, 2021).

On the other hand, cardiovascular disease particularly remained the world's leading cause of morbidity and mortality. Early results from China show that patients with CVD (13.2%) and older patients had higher COVID-19 death rates in hospital admitted patients than patients with other comorbidities such as 9.2% diabetes, and 8.4% HTN respectively (Ganatra et al., 2020).

Because of COVID-19's quick spread throughout the UK, approximately 125,000 deaths associated with the disease have been documented there (Dockerill et al., 2021).

However, due to exposure to the COVID-19 pandemic, CVD patients' stress levels were higher than usual.As a result, the NHS implemented echocardiography by COVID-19 norms and regulations to depress the stress level among people with CVD during the pandemic (Dockerill et al., 2021).According to additional research on the relationship between cardiovascular disease and COVID 19 by Wang et al. (2020), cited in Mahenthiran, Mahenthiran, and Mahenthiran (2020), the general arrhythmia incidence in Wuhan, China, was 16.7%, but it increased to 44% in ICU patients during COVID-19.

Along with the patient's experience of cardiac disease during the COVID-19 pandemic, during the COVID-19 crisis, health and social care providers had to provide end-of-life care while under both practical and emotional pressure. Increases in the number of patients getting end-of-life care decreased staffing levels because of illness and relocation, as well as the passing of coworkers or members of their own families, were among these factors. The pandemic pressures hurt clinicians' ability to provide the psychological care that patients and their families needed near the

end of life.To improve the well-beginning and after an outbreak, it is important to create work settings that value self-care, introspection, and accessibility to psychological assistance (Hanna et al., 2021).

Considering this, potential COVID-19 survivors may be at an increased risk for cardiovascular disease (CVD) due to a systemic immune response that was heightened during COVID-19 (Heckel, 2021).As a result, the overall fundamental goal of the dissertation about the interactionbetween COVID-19 and cardiovascular disorders has been rigorously examined. However, there are still gaps in the literature.

4.2 The gap in the literature

There has been a lot of research done in the literature that describes the entire experience of a person with CVD during COVID-19. Research from Wuhan City found that 50 per cent of the total COVID-19 patients died from heart failure (HF) (Zhou et al., 2020 cited in Mahenthiran, Mahenthiran and Mahenthiran, 2020).Minimal information is available due to the predominance of cardiac arrhythmia in COVID-19, hence additional studies should be required to close the knowledge gap.

Additionally, being unemployed during the COVID-19 pandemic increases the risk of myocardial injury (MI) since it causes intense mental stress both before and after coming in touch with the virus (Roche et al., 2022). Hence, literature cited by Roche et al., (2022) successfully administered the intensity of MI during COVID-19 but the knowledge gap should be monitored in terms of unemployment. Subsequently, the literature gap has been critically analysed and explored in terms of Vitamin D associated with CVD patients during covid-19. Vitamin D is an essential component that can be used for both therapeutic and preventive purposes. Its use can be broadened to fight COVID-19 (a communicable disease) and CVDs (a non-communicable disease), the two most deadly pandemics we now face (Singh et al., 2022). Although more research is demonstrating the epidemiologic, immunologic, and clinical relationships between vitamin D and several illnesses, including COVID-19, additional studies are still required to completely understand its role and the implications for public health intervention.

Further, a scoping technique was used to provide a thorough explanation of the generated objectives for completing the dissertation work.

4.3 Objective 1: How is CVD a risk factor associated with COVID-19?

Middle East respiratory sickness (MERS) and severe acute respiratory syndrome (SARS) caused by beta-coronaviruses share the same subtype as SARS-CoV-2 (MERS). Just two of the cardiovascular problems that SARS-CoV-2 may have caused were acute myocardial syndrome and myocardial infarction. According to findings on cardiac involvement, SARS-CoV-2 and COVID-19 that cause MERS, as well as SARS, appear to have similar pathophysiology (Singh et al., 2020).

According to Singh et al. (2020), in patients who were admitted to an intensive-care unit (ICU) for a serious illness, the frequency of acute cardiac injury caused by COVID-19 was almost thirteen times higher than in those who did not require ICU admission, same, with an average prevalence of 8% to 12%revealed the most common cardiovascular impact of COVID-19 as acute myocardial injury (Zhou et al., 2020 cited in Singh et al., 2020).

Moreover, vaccination is the first line of protection in the 2019 fight against coronavirus disease (COVID-19). Numerous mild adverse effects have been reported; these are cautiously handled in addition to significant ones, such as heart failure or heart attack.However, some vaccinations, For instance, Moderna (Aneeqa et al., 2022) hurt those who have cardiovascular disease (CVD), such as shortness of breath and chest pain that begins one week after the vaccination. And Oxford-AstraZeneca and Johnson and Johnson vaccines caused thromboembolism in CVD patients (Rosano et al., 2021). To stabilise their clinical status, each patient with HF should receive the COVID-19 immunisation with proper caution.

It is possible to determine whether mortality is declining even though fewer people are experiencing heart failure, a comparatively well-defined cardiac incident, or whether survival is increasing among those who do through the

analysis of changes in the prevalence rate and overall integrity of myocardial infarction (MI) (Crimmins and Beltran-Sanchez, 2010) as well as a limitation upon MI lead during COVID-19 been critically explored (Saririan et al., (2021). Additionally, the cited literature thoroughly examines how individual lifestyle choices during COVID-19 affected heart damage (Modica et al., 2022).

4.4 Objective 2: How are CVD patients experience quarantine periods and changes in lifestyle during COVID-19?

Many CVD patients encounter the quarantine period and its impact on their physical lifestyle due to covid-19. The benefits of physical movement on a person's physical and emotional well-being are widely acknowledged (Heckel, 2021). Nevertheless, the enforced lockdown/restriction techniques, such as having just a small amount of time every day to exercise outdoors, may have reduced a person's potential to be fit and healthy while also creating a setting wherein sedentary behaviour is more common.It is widely recognised that these have negative effects on one's health and general quality of life (Kite et al., 2021).More specifically, regular engagement in moderate-to-vigorous physical activity (MVPA) has been shown to reduce the risk of heart conditions such as myocardial infarction, ischemic injury, and stroke (Heckel, 2021).

Since rehabilitation programmes were implemented to provide treatment and support to CVD patients during COVID-19, health and social care practitioners made every effort to provide care by the literature cited and examined.Cardiopulmonary rehabilitation is the cornerstone of the treatment of people with cardiovascular disease and chronic pulmonary disease. An individually designed, under-supervision workout program forms the basis of these rehabilitation programmes (aerobic exercises, muscle strengthening, and breathing exercises). In addition to reducing morbidity, exercise rehabilitation has been proven to dramatically enhance the quality of life, cardiorespiratory fitness, and symptoms in patients with pulmonary disease (Besnier et al., 2022).

The American College of Cardiology, the American Heart Association(Long et al., 2020 cited in Kirsch and Vitiello, 2022), and the European Society of Cardiology(Pelliccia et al., 2020 cited in Kirsch and Vitiello, 2022)all advise cardiac rehabilitation.Under these conditions, patients may participate in cardiac rehabilitation, a specialised program of exercises and education, to improve their health, rehabilitate after surgery, or cure heart disease.

Hence, according to Kite et al. (2021), scientific and health professionals have been vocal about the need for the public to exercise frequently, especially for heart patients throughout the shutdown measures, and this has been mirrored in international government recommendations/policies.

4.5 Objective 3: How did self-management of CVD and assessments change during a lockdown?

Physical activity and nutrition control at home serve as forms of self-management and assessment during the lockdown.Cardiac rehabilitation programmes have been developed to preserve the physical health of CVD patients in the general population and to guarantee optimal care(Besnier et al., 2022).

Further work was done by (Kirsch and Vitiello, 2022) regarding the telehealth app, because of COVID-19 inherent restrictions so Active+me is a mobile health app invented, that is used by both patients and medical professionals to get moving.

Patients' skills, knowledge, and confidence in their ability to control their heart problems increased after using Active+me. Patients at high risk for cardiovascular incidents appeared to gain the most. Short-term reductions in systolic blood pressure and improvements in self-reported physical activity were associated with increases in patient activation. Therefore, excessively large, controlled trials are necessary to confirm the advantages of using Active+me to improve remotely delivered cardiac rehabilitation(Frith et al., 2021).

4.6 Objective 4: How did hospitals' management of CVD patients affect due to social distancing?

Ayenigbara et al. (2020) critically analysed that the term "social distance" is used to denote any kind of reduced interpersonal engagement. Interpersonal and public social distance can be separated into two groups. A series of rules put in place during the COVID-19 outbreak to ensure that huge crowds of people are not allowed is known as public social distance. Bans on travel, the closing of schools and offices in addition to the shutdown of stadiums, theatres, arenas, and shopping centres, are just a few examples of these. Personal social distance, however, describes the actions people take to minimise their engagement with others. These safety measures include remaining at home, avoiding crowded places, skipping handshakes and embraces, and avoiding pointless travel. Gando et al. (2010) stated that the management of the hospital was severely harmed because of social isolation. For instance, obese CVD patients have cardiovascular risk and inflammation because there is less interaction between the doctor and the patient during in-person appointments.

Further, during a pandemic, inadequate management and self-care increase the risk of heart failure. As a result, smartphone-based mobile health (mHealth) efforts have shown promise in improving the level of self-care among these patients and consequently the course of their ailment. To promote patient-physician communication regarding care and lower the risk of heart failure during COVID-19, mobile health has two main objectives(Bakogiannis et al., 2021). To quantify physical activity, a cuff accelerometer was utilised to record daily minutes of exercise as well as the overall number of steps done throughout the day. Additionally, a sticky tape was utilised to measure their body composition to keep their BMI and a digital blood pressure monitor to access and monitor blood pressure (Frith et al., 2021).

To summarise, patients with CVD are now taking much better care of themselves in several areas because of mobile health devices (Heiney et al., 2020). While some locations lack internet access and the patients are uneducated, these factors make it impossible for them to learn how to utilise digital healthcare apps or gadgets. The efficacy of the Health and wellbeing Heart app should thus be further studied considering the clinically relevant alterations identified in this feasibility study of the Healthy Cardiac app.

4.7 Objective 5: What are the long-term effects on individuals' life with cardiovascular disease during COVID-19?

Numerous long-term clinical symptoms, including headache, vomiting, diarrhoea, fever, cough, and coughing, may be present in COVID-19 patients. Long-term impacts also include a decrease in physical activity and restrictions on extracurricular activities, which can lead to illness and obesity in people.Aside from that, thrombosis can occur although clinical diseases are more typical. Thrombotic issues can occur in up to 31% of critically ill COVID-19 patients(Klok et al., 2020 cited in Mahenthiran, Mahenthiran and Mahenthiran, 2020).

Subsequently, Cardiovascular diseases (CVDs) are caused by a variety of causes, the two biggest of which are a sedentary lifestyle and insufficient exercise. By raising cardiac morbidity, arterial stiffness, the amount of high-density lipoprotein (HDL) cholesterol, mitochondrial dysfunction, and a decrease in lipoprotein lipase activity, inactivity leads to metabolic issues (Lavie et al., 2019 cited in Kirsch and Vitiello, 2022). Additionally, the long-term negative impact of COVID-19 infection in CVD patients may include coughing and shortness of breath(Shah et al., 2022).

4.8 Objective 6: How might COVID-19 risk increase the mortality rate of CVD patients?

Preliminary data from China showed that patients who were older and those who had a CVD (13.2%) died from COVID-19 at a greater rate than patients who had other comorbiditiessuch as diabetes (9.2%) and hypertension (8.4%) than the nearly 1% of individuals without these comorbid conditions (Ganatra et al., 2020).

The prognosis for SARS-CoV-2-infected HF patients is quite poor, particularly if they have circulatory decompensation, are very symptomatic, or are at an advanced stage of the disease. According to (Banerjee et al., 2021), by the

middle of May 2020, England and Wales will have 3.8 million affected people and 100,000 people per year are expected to die.Additionally, racial differences can be evident in the higher COVID-19 cases and fatality rates among African Americans and Hispanics relative to European Americans, most likely because of their darker skin and lower vitamin D levels(Yancy, 2020; Yehic et al., 2019; Gindle et al., 2009 cited in Singh et al., 2022).

In addition, by April 9th, 2020, 184 countries had received reports of more than 1,550,000 cases with lab confirmation. Sadly, COVID-19 has been responsible for nearly 90,000 deaths (Burrage, 2021).The coronavirus (COVID-19) pandemic is putting unprecedented strain on healthcare systems around the world. The UK's National Health Service (NHS) is dealing with the most challenging scenario in its 70-year existence because of the 125000 deaths attributed to COVID-19(Dockerill et al., 2021).

Furthermore, this study acknowledged both similarities and differences in literature findings.Rosana et al. (2020) and Fries (2010) critically examined the idea of morbidity and mortality and how they affected patients' health and came to the same conclusion. They contend that the COVID-19 pandemic significantly altered the epidemiology of HF by directly and indirectly raising morbidity and mortality.The same core idea (morbidity and mortality) was rigorously analysed by Hanff et al. (2020) and revealed a different finding: cardiovascular disease and other comorbidities are strongly connected with COVID-19, but the underlying processes are yet unknown.Bakogiannis et al. (2021) and Frith et al. (2021) acknowledged the same literature's findings to show the appropriate care and treatment during the COVID-19 pandemic along with the restriction of face-to-face consultation and noted that the mobile phone or telehealth initiatives have illustrated special potency in enhancing the level of self-care among patients and consequently improving the course of their condition.

4.9 Limitations

Several limitations to this secondary study need to be acknowledged.

- There were no other content types except literature. Because most observational studies from the initial search were disregarded because they were from 2020.
- The study was conducted using internet databases, literature, or articles; there was no active participant interaction or behaviour management.
- Due to COVID-19's timetable, there are additional restrictions on the data that has been consolidated for CVD patients.
- More study is required to come to more firm results because studies on cardiovascular disorders during Covid-19 are still relatively new.Long follow-up times are important, especially when assessing long-term repercussions.
- The brief discussion has been acknowledged due to the limited amount of data that is currently available in my study. However, research is being released swiftly, and once more data is accessible, more firm conclusions can be drawn in the future piece of work.

The timetable of COVID-19 also places restrictions on the material gathered in this review itself. Studies on COVID-19 and cardiovascular and cardiac disorders, in general, are quite recent, and further research is required to come to more firm results.

Chapter 5
Conclusion

The literature on cardiovascular disease and COVID-19 has been properly compiled in this scoping review, which also identified areas that require more study. The term COVID-19 and related search terms like coronavirus, epidemic, and pandemic were first introduced. The overview of COVID-19 has been thoroughly and critically analysed. Along with covid-19, the overall study's objectives have been critically acknowledged and analysed for terms like cardiac illness, cardiac problem, cardiac manifestation, and cardiac attack.Following that, a review of COVID-19 and cardiac illnesses also considers mortality and morbidity. A set of illnesses characterised by the heart and blood arteries is defined as

cardiovascular disease, according to the World Health Organization's first stage of its investigation into CVD (WHO, 2022). Another noteworthy description of cardiovascular illness reads, "A set of ailments which concern the heart and the blood vessels as well as the effects of inadequate blood flow as well as the circulatory network is known as cardiovascular disease. Coronary heart disease, cerebrovascular disease, peripheral artery disease, rheumatic heart disease, and congenital heart disease are the classifications that CVD is further broken down into to provide information on the disease.

Overall, this review study has successfully compiled the body of research on cardiovascular disease and COVID-19, and it has highlighted areas that require additional study.Furthermore, we didn't gather the raw data, all information was gathered by consulting earlier literature.Several other recent observational studies lacked generalizability since they were very focused, which was against the review's purpose. Likewise, observational studies require longer periods, therefore the limited timeframe has made it difficult to analyse most of the COVID-19 literature in terms of CVD patients' attitudes.

Subsequently, the desired outcome of the above-cited study was compiled through various sources of literature on the relationship between COVID-19 and CVD as well as the gap that was critically assessed (Januzzi, 2020 cited in Mahenthiran, Mahenthiran and Mahenthiran, 2020).The key theme component that CVD patients encounter during pandemics is myocardial damage.A report of cardiac involvement based on the pathophysiology of the coronaviruses was examined by Singh et al. (2020) and expressed as an incidence of acute cardiac injury caused by COVID-19 that was about 13 times greater than patients who did not have access to critical care.

The acknowledgement and use of the Active+me app(Kirsch and Vitiello, 2022)throughout the epidemic time is another major and intriguing observation. Due to the limitations of COVID-19, which also affects Cardiovascular patients who struggle to properly execute their cardiac rehabilitation programmes, athletes and the public now have fewer opportunities to participate in physical activity. For these reasons, patients and professionals are urged to use a mobile health device like Active+me to ensure patient safety.

Additionally, people with COVID-19 infections and CVDs, which damage the blood vessels and heart are deficient in vitamin D, an important mineral. The relevance of vitamin D for cardiac health and the connection between vitamin D deficiency and the cardiac issues that afflict one billion people globally were highlighted in a recent review by (Latic N. and Erben RG 2020). Most of the observational and ecological research solidly supports the cardiovascular preventative benefit of vitamin D, even though only a small number of trustworthy interventional studies show a connection between vitamin D intake and improved cardiovascular health(Singh et al., 2022).

There is a conclusive explanation for how COVID-19 came to be a risk factor for people with cardiovascular disease during the pandemic. Moreover, social withdrawal and lockdown had an impact on cardiac self-management.The timetable of COVID-19 also places restrictions on the material gathered in this review itself. Studies on COVID-19 and cardiovascular and cardiac disorders, in general, are quite recent, and further research is required to come to more firm results.

As of now, trends and patterns in the COVID-19 pandemic's mortality rate for cardiovascular patients have been discovered by both direct and indirect healthcare infection.Additionally, the pattern those statistics indicated has been carefully examined and presented in terms of numbers.An additional examination of the data shows that older CVD patients have the highest death rate (13.2%) when contrasted with patients (with cardiovascular disease) with other related risk factors, such as diabetes (9.2%) and hypertension (HTN) (8.4%), respectively.We now turn to the statistics annual report from the World Health Organization from 2021, which details CVDs and declares them to be the main cause of mortality globally.Then, to meet the requirements of the whole piece of the dissertation, general goals and objectives relating to research issues have been discussed and pinned.Additionally, a crucial element—the strategic plan and its implementation procedure—helped in the selection of the literature. All genres of literature have been picked

based on these two factors, and methodology is extensively covered in chapter 2. Most importantly, throughout the effort, all-inclusive and exclusive criteria have been followed and put into practice.

Several significant findingsfrom chapter 3 (Literature review) have been critically analysed and acknowledged. Firstly, the individuals with cardiovascular disease experienced 'Myocarditis', which resulted in rapid mortality. Physical activity is probably a trigger for dangerous arrhythmias and may raise the risk of myocardial injury in athletes with myocarditis, however, there is little evidence and literature on this topic. Long lengths of time are required for follow-up, particularly when examining long-term repercussions.As a result, there are not many clinical data points available, which limits how this scoping study can be applied.However, research is being released swiftly, and once more data is accessible, more firm conclusions can be drawn.

Second, heart disease and cardiac arrest are worse when there is unemployment during a recession. Additionally, being unemployed during the COVID-19 pandemic increases the risk of cardiac infarction since it causes intense mental stress both before and after coming into touch with the virus.

Consequently, prioritising these study areas going ahead is necessary. Every article found suggests that a person's present state of health influences how the experience of having a CVD during the COVID-19 epidemic affects that person's health. There is enough evidence to corroborate the postulated underlying pathways linking cardiovascular disease and COVID-19, and after contracting COVID-19, cardiovascular disease becomes a risk factor for poor healthcare outcomes. Between the chosen literature, there were no apparent differences in the conclusions.

Another factor considered in this piece of work is mobile health. Patients with cardiovascular diseases were unable to obtain normal care on their own because of the strict social isolation established in response to the increase in COVID-19 cases.Because some COVID-19 symptoms resemble those of cardiovascular illness, there is a danger of exposure in outpatient settings. Patients can be evaluated for the necessity for in-person consultations via telemedicine via phone or video calls. Additionally, to provide person-centred care effectively at times like the COVID-19 pandemic, "Tele-Health" or 'Mobile health' has been introduced. This is because face-to-face treatment and research have been suspended to stop the COVID-19 spread. Additionally, the coronavirus (COVID-19) pandemic is killing millions of people, and the rise in non-communicable diseases (NCDs) is already influencing the health care system. So, it has been argued together with chosen literature as support for the idea of morbidity and mortality that "the rise in illness incidence would counteract the decline in chronic disorder mortality during a pandemic."

Additionally, in this dissertation work, the significance of vitamin D serves as a key issue. Vitamin D, which is believed to promote bone health, regulates calcium levels.Latic N. and Erben RG. (2020) underlined the role of vitamin D for cardiac health and the connection between vitamin D deficiency and cardiac issues. While, the synthesis of vitamin D and solar ultraviolet B (UVB) exposures are shown to have inverse connections with COVID-19 (Singh et al., 2020). Furthermore, Severe acute respiratory infection has frequently been linked to heart dysfunction as a complication. The degree of the illness and the aggravation of the heart condition are predisposed by pre-existing cardiac ailments. It is crucial to identify cardiovascular illness patients' behaviour early using clinical and laboratory indicators and to treat it during the pandemic period. Clinical trials are now being conducted, and other studies will be conducted to analyse the illness and available treatments. This information will help doctors treat patients and policymakers' effective approach to proper management of the cardiovascular components of COVID-19.

The importance of vitamin D as a theme in this dissertation work is also noteworthy. Calcium levels are managed by vitamin D, which is also known to support bone health.Due to seasonal fluctuations in various parts of the world, the amount of vitamin D relates to COVID-19, and it has a significant impact on people with heart conditions.However, more study is still advised to determine the true impact of vitamin D on cardiac patients during COVID-19.

Although there were differences in the authors' levels of confidence in particular results, they all agreed that the current state of the data prevented any firm conclusions from being drawn. Every paper underlined the value of the additional study.

5.1Strength and Limitations

The strength of the studyis that,

- The lack of human interaction makes it cost-effective.
- Easy to access because data is collected through primary or already done research work online.
- Focus is on re-analysing or re-interpreting previous research.
- the quantitative research method enables the discovery of quantifiable facts and information.

Several limitations to this secondary study need to be acknowledged.

- There were no other content types except literature. Because most observational studies from the initial search were disregarded because they were from 2020.
- The study was conducted using internet databases, literature, or articles; there was no active participant interaction or behaviour management.
- Due to COVID-19's timetable, there are additional restrictions on the data that has been consolidated for CVD patients.
- More study is required to come to more firm results because studies on cardiovascular disorders during Covid-19 are still relatively new.Long follow-up times are important, especially when assessing long-term repercussions.
- The brief discussion has been acknowledged due to the limited amount of data that is currently available in my study. However, research is being released swiftly, and once more data is accessible, more firm conclusions can be drawn in the future piece of work.

The timetable of COVID-19 also places restrictions on the material gathered in this review itself. Studies on COVID-19 and cardiovascular and cardiac disorders, in general, are quite recent, and further research is required to come to more firm results.

5.2 Future Recommendations

Due to the dearth of information in the literature on COVID-19 and cardiovascular disease, only a limited amount of information has been rigorously analysed and aggregated in this work due to the restricted time frame; however, additional research should be conducted in the areas that have been suggested below.

Firstly, it has been recommended to conduct further research on the Active+me mobile app and the advantages of using this app to properly deliver cardiac care plans. so that we can clearly understand the beneficial effects of mobile or telehealth services on cardiac patients during COVID-19.

Secondly, further research needs to be conducted to identify the root cause of CVD and other comorbidities that are strongly linked to COVID-19 and the individual's response as well.

And lastly, moreresearch should be done on the relationship between vitamin D levels in cardiac patients during the coronavirus pandemic. Further attention should be paid to seasonal fluctuations and how they affect the vitamin D levels in cardiac patients during COVID-19.

Therefore, all the recommended research has been carefully considered and accepted to satisfy the requirements of this piece of work.

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