

# Critical Assessment of the Implications of Self-medication With Natural Products During Disease Outbreaks Among People in Developing Countries

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## Systematic Review

**Keywords:** self-medication, natural products, abuse, public health, healthcare, disease outbreaks, drug abuse, Covid-19 pandemic, traditional medicine, developing countries

**Posted Date:** August 2nd, 2023

**DOI:** <https://doi.org/10.21203/rs.3.rs-3210901/v1>

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# Abstract

**Background:** Self-medication with natural products during disease outbreaks is a major public health challenge in developing countries. Unlike self-medication with Over the counter (OTC) medication which receives significant attention in published literature, natural products have significant health implications, especially during times of disease outbreaks which are yet to be fully explored. Not backed by scientific evidence, the act can lead to a false sense of security among people, leading to a further spread of the disease amongst other implications. People need to be informed about self-medication risks and the professionally prescribed benefits of natural products and to seek appropriate medical care when necessary.

**Objectives:** The purpose of this dissertation is to assess the implications of self-medication with natural products during disease outbreaks among people in developing countries. It tries to answer the following questions: (1) what is the state and quality of evidence in current literature (2) what are the gaps in literature (3) what are the determinants and contributing factors to self-medication with natural products during disease outbreaks among people in developing countries (4) what are the implications and (5) what are the possible solutions?

**Method:** This dissertation was conducted using a modified systematic literature review methodology. The search protocol utilised for the search and selection of relevant materials from literature used in synthesising the findings of the study was documented using the PRISMA. The database search result was selected for review after the application of limiters, duplicate removals, exclusion and inclusion criteria, full-text review, and screening. The final selected articles were assessed for quality and bias using the 20 points system in AXIS critical evaluation tool. Data were extracted into themes using a Microsoft word table from which findings were synthesised.

**Findings:** The initial database search yielded 1,683 reports from which 20 articles were selected for the review. Overall, 71.4% of the 14 articles assessed for quality and bias accrued 15 or more points on the 20 points system in AXIS critical evaluation tool, indicating that they were relatively of good quality. While all twenty (20) articles mentioned at least three or more factors or determinants of self-medication with natural products during disease outbreaks, only six (6) articles mentioned one or more implications, therefore demonstrating that there is a dearth in literature in this regard, which needs more exploration. The findings indicate that women are more likely to self-medicate with natural products than men, acquisition and ideological factors had the most influence on self-medication while the most common side effects were Diarrhoea, Stomach pain, Sweating, Headache, and Nausea/vomiting. Findings indicate that steam inhalation and herbal baths increased the risk of COVID-19 infection and people who self-medicate with natural products are more withdrawn and had less communication with their physicians. These people may suffer side effects not reported to their doctor and this might account for the paucity of reports on the implications of natural products used during disease outbreaks.

**Conclusion and implication of key finding:** The use of natural products for self-medication during disease outbreak is a rampant practice in developing countries. While natural products may be more readily available, accessible, and affordable, there are potential risks and implications of natural products' use for self-medication. People need to be informed about this, encouraged to speak about their predicaments and seek appropriate medical care and support when necessary.

## INTRODUCTION

### 1.0 BACKGROUND

Self-medication with natural products and the potential for abuse is a public health issue with profound adverse health implications. While self-medication is considered a form 'of self-care, abuse resulting from this is very prevalent in recent times (Khatony et al., 2020; Owusu-Ofori et al., 2021). The WHO (2014) defined 'self-care' "as the ability of individuals, families, and communities to promote health, prevent disease, maintain health, and cope with illness and disability with or without the support of a healthcare provider". In other words, self-care refers to decisions made by individuals or communities based on their peculiar circumstances which inform actions taken to maintain their physical and psychological well-being (Gómez-Borges et al., 2022). It can thus be argued that self-care is subjective; since the concept and perception of health and circumstances that threaten health varies widely from one individual or community to another. And thus, the decision and actions taken as self-care would vary widely as humans perceive threats differently. In this variation lies the possibility for abuse.

### 1.2 THE ROLE OF SELF-MEDICATION IN HEALTHCARE

Self-medication is the use of medicines or perceived medicinal products to treat or prevent self-perceived or self-identified diseases or symptoms or threats to health by an individual without professional medical consultation or prescription (Tarcuc et al., 2020; Malik et al., 2020; Makowska et al., 2020). Some researchers argue that self-medication if done correctly can be considered an important part of the

healthcare system in which the population is educated to take responsibility for their health as informed by medical and pharmaceutical services, thereby reducing the burden on health services (Malik et al., 2020; Fekadu et al., 2020). Unfortunately, self-medication is usually informed by self-perceptions (Akande-Sholabi et al., 2021), recommendations from families, relatives, friends, colleagues, and peers (Aslam et al., 2021), and the media (Wegbom et al., 2021) therefore increasing the likelihood of misinformation and abuse.

### 1.3 DRUG ABUSE AND NATURAL PRODUCT ABUSE

Drug abuse generally refers to the conscious inappropriate use of drugs or medications for pleasure, perceived necessity, or anxiety with the risk of addiction or damage to health (Fuchshuber & Unterrainer, 2020; Piotrowski et al., 2021). *Natural product abuse is a form of drug abuse in which natural products of plants, animals, environmental and microbial origins with medicinal properties are abused during self-medication with the potential to cause self-harm or resulting in self-harm.* Natural products have been utilised by humans since prehistoric times for the treatment and prevention of disease (Chopra & Dhingra, 2021). The early humans explored natural products with little or no knowledge while searching for food, leading to the consumption of poisonous substances which frequently led to toxic reactions, ill health, and deaths, but in this way gradually gathered knowledge of edible and medicinal substances (Andrews & Johnson, 2020). This ever-evolving knowledge base with the help of modern technologies and techniques now serves as the basis for modern medicine and pharmacology (Atanasov et al., 2021) and complementary and alternative medicine (CAM) (Tangkiatkumjai et al., 2020). However, with more knowledge comes the need for responsibility and appropriate use, where these are lacking abuse is inevitable.

### 1.4 DISEASE OUTBREAKS AND DRUG ABUSE

According to Adger (2021), several psychological factors could lead to substance or drug abuse. Stress, anxiety, and depression are common risk factors (Windarwati, et al., 2021) which have been associated with substance or drug abuse during disease outbreaks (Panchal et al., 2020; Taylor, 2022). The WHO (n.d.) defines a disease outbreak as "*the occurrence of cases of a disease in excess of what would normally be expected...*". Epidemiologically, a disease outbreak can have an unexpected increase in new cases within the bounds of a defined geographical area (epidemic) or may exponentially increase and spread across geographical boundaries in most cases internationally (pandemic). This characteristic 'increase in new cases' if not adequately controlled by the relevant authorities, leads to public panic resulting in stress, anxiety, and depression. Thus, as part of the panic response by the population, individuals can be found to self-medicate with natural substances leading to potential abuse.

### 1.5 NATURAL PRODUCT USE DURING DISEASE OUTBREAKS

As earlier mentioned, people and communities respond to health threats differently, and this is reflected in their panic responses during disease outbreaks. Although the use of natural products for self-medication during disease outbreaks has been reported widely across several geopolitical enclaves (Feng et al., 2021), this practice has been highlighted as rampant in Asia (Liana & Phanumartiwath, 2021), Africa (Anjorin et al., 2021) and Latin America (Bendezu-Quispe et al., 2022) in literature especially with regards to the Covid 19 pandemic. Besides the notable Covid-19 pandemic, other disease outbreaks with reported use of natural products include; Spanish Flu (Wang et al., 2011), Swine Flu (Shah & Krishnamurthy, 2013), Asian Flu (Macfarlane & von Furer Haimendorf, 1981), Bird Flu (Pinn, 2006), Severe Acute Respiratory Syndrome (SARS) (Liu et al., 2004), HIV and Aids (Gwesere, 2010), Third Plague Pandemic (Tsai, 2021), Antonine Plague (Velimirovic & Velimirovic, 1989), Japanese Smallpox Spidemic (Fakhriati & Yusuf, 2020), Yellow Fever Epidemic (Tannenbaum, 2021), Ebola Epidemic (James et al., 2020) and Cholera Pandemic (Sibandze & Dlundlu, 2023), etc.

### 1.6 EVOLUTION OF NATURAL PRODUCT UTILISATION

The use of natural products played a pivotal role in human survival during these historic disease outbreaks (Wiat, 2021). The WHO (2015) echoed that natural products are not only relied on by communities for food but also for medicinal and cultural purposes. The use of natural products has significantly gained influence over time and now becoming the 'go-to' standard for most deprived people and communities during epidemics and pandemics. The use of natural products has evolved significantly within the last century (Fakhriati & Yusuf, 2020) with techniques and terminologies such as traditional medicine (TM) and herbal medicines (HM) (Shahrajabian et al., 2021), others include complementary medicine (CM), traditional and complementary medicine (T&CM), complementary and integrative medicine (CIM), or complementary and alternative medicine (CAM) (Mulder et al., 2022) being used interchangeably. The WHO (2013) choose the term 'traditional medicine' to address practises in which cultural and indigenous knowledge and skills are utilised with natural products to maintain health and prevent disease. It also acknowledges the various terminologies used in the public domain in providing statistics in this

regard. The WHO (n.d.) website states that 170 WHO member states acknowledged their use of T&CM since 2018, 50% of its 194 member states had a national policy on the use of T&CM and 124 member states reported the presence of law or regulation for HM as of 2018.

## 1.7 REPORTS OF SELF-MEDICATION WITH NATURAL PRODUCTS DURING COVID-19 PANDEMIC

Several reports of self-medication with natural products during the Covid-19 pandemic flood current literature regarding TM (Yimer et al., 2021), HM (Bulatova et al., 2022), CM (Xiao et al., 2020), T&CM (Ganguly & Bakhshi, 2020), CAM (Paudyal et al., 2022) and CIM (Lam et al., 2021). Commonly cited examples of natural products used are from plant origins such as eating pawpaw fruits (Bertuccioli et al., 2022) ginger and green tea (AlNajrany et al., 2021), drinking alcohol, burning incense, wearing a garlic necklace, smoking cotton (Nejat et al., 2021), also from animal origin such as eating honey (AlNajrany et al., 2021), inhaling donkey droppings (Nejat et al., 2021) and drinking cow urine (Reihani et al., 2021) and from the environmental origin such as drinking concentrated salt water (Islam et al., 2021), hand washing with Alum water (Prakash et al., 2021), steam inhalation (Nuertey et al., 2022) and sun bathing (Islami et al., 2020; Ajibo, et al., 2020) among others. The prevalence of self-medication with natural products during the Covid-19 pandemic to a large extent has been assessed in various countries, not in isolation but, majorly with other forms of self-medication in literature (Quincho-Lopez et al., 2021), however in these studies the use of natural products (especially of plant origin) always stands-out irrespective of the location or population, especially in developing countries.

## 1.8 PREVALENCE OF SELF-MEDICATION WITH NATURAL PRODUCTS DURING DISEASE OUTBREAKS

There are arguments in favour of the implications of natural products used during the Covid-19 pandemic in this regard (Alam et al., 2021), a systematic review and meta-analysis of randomized controlled trials of the use of herbal medicines for the treatment of the Covid-19 pandemic by Ang et al., 2020 shows that Western medicine in combined therapy with Herbal medicine had a significantly improved total effective rate (RR 1.23, 95% CI 1.13 to 1.34,  $p < 0.001$ ) than Western medicine alone. A similar systematic review finding was also reported by Yu et al., 2022 with traditional Chinese medicine together with Western medicine having a higher effective rate (RR = 1.24, 95% confidence interval (CI): 1.16–1.33) than Western medicine alone. Such findings could foster the prevalence and stand as a rationale for self-medication with natural products. A global systematic review of published papers between 1st April 2020 to 31st March 2022 by Ayosanmi and colleagues titled '*Prevalence and correlates of self-medication practices for prevention and treatment of COVID-19: A systematic review*' published in June 2022 showed that the pooled prevalence rate of natural products usage from 14 studies in 14 countries with a total of 15,154 participants was 50% and amongst others.

Some notable national prevalent studies involving the use of one or more forms of natural products include a study by Nguyen et al., 2021 reported 49% of 508 participant utilisation of natural product in Vietnam; Parvizi et al., 2022 reported 69% of 400 participant utilisation in Iran; Umata Chali et al., 2021 reported 46% of 422 participant utilisation in Ethiopia; Lin et al., 2022 reported 67.1% of 1132 participant utilisation in China; Satyanarayana et al., 2023 reported 66% of 427 participant utilisation in India; Amuzie et al., 2022 reported 43.7% of 469 participant utilisation in Nigeria; Mphekgwana et al., 2021 reported 30.4% of 400 participant utilisation in South Africa; AlNajrany et al., 2021 reported 64% of 1473 participant utilisation in Saudi Arabia; Guidos et al., 2022 reported 73% of 159 participant utilisation in Timor-Leste and Ayima et al., 2021 reported 68.5% of 1100 participant utilisation in Cameroon.

## 1.9 CAUTIONING THE USE OF NATURAL PRODUCTS DURING DISEASE OUTBREAKS

With the growing prevalence of self-medication with natural products, the WHO (2020) expressed worries about the trend, especially during the Covid-19 pandemic, and cautioned against this. Although it recognises the potential of medicinal plants such as *Artemisia annua*; commonly used in Africa for the treatment of Covid-19 during self-medication, it echoed the fact that there are no clinical trials to prove its efficacy and cautioned its use due to possible safety concerns. It also iterated the need for the ministry of health of developing countries to work towards registering and providing evidence-based reports on the safety, efficacy, and quality of natural and traditional medicine products commonly used for self-medication by people and communities. As this would help to inform the public on what and what not to self-medicate. While emphasising the need for public enlightenment, it reiterated the possible harm and risk of the population relying on mass misinformation from social media regarding the effectiveness of certain remedies from natural products as experienced during the Covid-19 pandemic (WHO, 2020).

Besides the WHO expressing caution on the use of natural products, the U.S. Department of Health and Human Services through the National Center for Complementary and Integrative Health (NCCIH) states: *'A lot of people believe that when it comes to medicine, "natural" is better, healthier, and safer than "unnatural" or synthetic drugs'* (NCCIH, n.d.). This statement echoes the need to be cautious with the use of natural products and debunks the general belief that natural products are safer than synthesised products, a major influencing factor to self-medication with natural products. The NCCIH also reported that some people argue that natural products have no side effects, a wrong notion attributable to the wrong belief that natural products are free from chemicals, as people do associate the term 'chemical' with toxicity (NCCIH, n.d.). This is possibly due to the belief that most pharmaceutical products are synthesised from chemicals in the laboratory. The NCCIH, therefore, echoed the need for strategic public enlightenment on these misconceptions iterating that the majority of the present-day pharmaceutical products originated from natural products and as such, natural products contain a significant amount of chemicals themselves and thus, can be toxic.

In the same vein, the NHS (2022), commented on the use of herbal medicines, re-echoing the NCCIH statement by saying *'being "natural" doesn't necessarily mean they're safe for you to take'*. It further advised that self-medication with such is inadvisable for those who are already on an orthodox medication or treatment or surgery, those with serious health conditions such as kidney disease, breastfeeding mothers and pregnant women, the elderly, and children. It however, encouraged the use of registered herbal products without medical supervision (i.e., self-medication) for coughs, common colds, or general aches and pains, which are the primary symptoms of most flu pandemics and the recent Covid-19 pandemic. Although, noting that using such for more serious conditions could be harmful. The NHS is not alone in the recommendation of herbal products for the treatment or prevention of Covid-like symptoms. Gajewski et al., 2021 reported on the potential of herbal products in its prevention and treatment, stating that over 85% of Covid-19 patients in China utilised Traditional Chinese Medicine (TCM) mainly from the herb *Glycyrrhiza glabra*, with significant survival rates based on anecdotal evidence.

However, Omokhua-Uyi & Van Staden (2021) while citing Ang et al. (2020), Cunningham et al. (2020) and Yang (2020) noted that several herbal products have been approved and registered for the treatment of Covid-19 by the Chinese government with three patented herbal formulations, yet there is no scientific or clinical evidence to demonstrate their efficacy or safety. Emphasising that it is indisputable that all drugs hold potential risk for users whether prescribed pharmaceutically or administered directly from natural products.

In conclusion, self-medication with natural products has become a global public health issue with potential abuse and severe health implications. Self-medication without professional consultation and guidance can lead to misinformation and abuse. While natural products have been used for medicinal purposes for centuries, there is a need for responsibility and appropriate use. Disease outbreaks, such as the Covid-19 pandemic, have led to a surge in the use of natural products for self-medication, particularly in Asia, Africa, and Latin America. This dissertation will focus on the implications of this form of self-care amongst its determinants and contributory factors in these developing continents.

## 1.1 AIM

This dissertation aims to assess the implications of self-medication with natural products during disease outbreaks among people in developing countries.

## 1.2 OBJECTIVES

To achieve this aim, the objectives of this dissertation are to:

- assess the state and quality of evidence in current literature while identifying any gaps.
- assess the determinants and factors associated with self-medication with natural products.
- assess the risks and implications of self-medication with natural products.
- assess possible solutions to self-medication with natural products.

## 1.3 DISSERTATION STRUCTURE

The purpose of this section is to highlight the overall structure of the dissertation in order to help guide the reader, foster understanding of the content presented and thereby, enhance the contextual flow of the work. Overall, this dissertation is structured into six (6) sequential chapters. Chapter one is the introduction section which sets the context and background of the dissertation. It presents the purpose and gives insights into the relevance of the work whilst outlining the aim and objectives of the dissertation. It also outlines the structure of the

dissertation. Chapter two is the methodology section which details the methodological approaches adopted in this dissertation. It presents a systematic report of the literature search protocol, search strategy employed, identification, screening, and inclusion criteria for selecting relevant literature upon which this dissertation is carried out. Chapter three is the literature review section which presents the relevant information of an initial scoping review done on the currently available literature to assess the current state of the literature on the dissertation topic, identify gaps, and acknowledge relevant underpinning conceptual and theoretical frameworks. The purpose of this section was to conduct a formative review to generate information which informed the direction of the study. Chapter four is the results section which presents the findings of the study. It presents findings on the state and quality of evidence in current literature and gaps. It extracted and evaluated and synthesised relevant data on the sources, determinants and contributing factors to self-medication with natural products during disease outbreaks, the implications, and possible solutions. Chapter five is the discussion section which expounds on the findings of the dissertation. Finally, chapter six is the conclusion and recommendation section. This section brings into the foreground the overarching relevance of the dissertation, its contribution to current literature on the topic, limitations and recommendations and calls to action.

## **METHODOLOGY**

### **1.0 BACKGROUND**

To help understand the implications of self-medication with natural products during disease outbreaks, a modified systematic literature review was conducted to assess the current literature on the topic covering the research question. The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) was used for documenting and reporting the review process together with screenshots of database search results. This chapter describes the research methods used to review the current literature identified and selected for this dissertation.

### **2.0 RESEARCH QUESTION (PEO FRAMEWORK)**

According to Snyder (2019), having a formulated research question is paramount to an efficient systematic literature review. In this dissertation, a Population, Exposure and Outcome (PEO) Framework (Moran et al., 2021) was used to formulate the research question. The research question is: "What are the implications of self-medication with natural products (O) during disease outbreaks (E) among people in developing countries (P)?" This framework is adopted because according to Capili (2020), the PEO framework is more appropriate for framing research questions in qualitative studies - which answers the 'what', 'why' and 'how' questions thereby ensuring the in-depth exploration of a phenomenon (Renjith et al., 2021).

### **3.0 MODIFIED SYSTEMATIC LITERATURE REVIEW**

This dissertation adopts a modified systematic literature review methodology while accessing its objectives and answering the research question. This method is adopted because systematic literature reviews in general are regarded as the bedrock of evidence-based medicine (Pfister & Lehmann, 2021) capable of synthesising high-quality and trustworthy research findings (van Dinter et al., 2021). It is an extensive review of current literature and synthesis of data driven by systematic approaches and methodologies on a topic or in answering a vital question (Paul et al., 2021). In other words, to address a clearly defined research question, a systematic literature review identifies, selects, and critically evaluates already published articles around the research question (Linnenluecke et al., 2020). The criterion for including a study is guided by a clearly outlined process or plan called protocol which ensures a thorough and transparent search across relevant scholarly databases, in a systematic way that allows other researchers to replicate the process (Mohamed-Shaffril et al., 2021). While the standard systematic literature review is mostly used to explore interventions within a specific topic area via the utilisation of mainly peer-reviewed academic and research publications, a modified systematic literature review explores more and has in addition, the inclusion of grey literature which includes textbooks, published reports, students' dissertations, non-peer reviewed manuscripts such as preprints, clinical guidelines, institutional policies, government and organisational websites etc (Marshall et al., 2021).

### **4.0 SEARCH STRATEGY**

A search strategy is a strategic way to obtain relevant literature for a study by defining the inclusion and exclusion criteria for literature materials guided by keywords from a research question (Mohamed-Shaffril et al., 2021). The search strategy is a strategically planned formulation of search strings made of Keywords and Boolean operators which guides the output of the database being searched. Boolean operators are used for defining the boundaries of the search output which ensures the inclusion of relevant literature in the search result

(Phillips & Barker, 2021). The use of 'AND' helps to narrow the search result, 'OR' helps to broaden the search and include other alternatives, while 'NOT' helps to exclude specific keywords which help to ensure the specificity of the search outputs (Rao & Moon, 2021). Truncators also play a role in helping to define search results. The use of the asterisk '\*' helps to automatically substitute words with varied suffixes, also the hash '#' symbol is used for words with varied spellings such as American and British spellings (Vimal, 2022). As part of the search strategy for this dissertation, several limiters were used to ensure that only the most relevant articles were collated (Lawless & Foster, 2020) which included a date range of 10 years (2013-2023) and duplicate removals.

## 5.0 KEYWORDS

Keywords are terms derived from the research question used for conducting a strategic search of the relevant database for literature materials (Xiao & Watson, 2019) needed for the dissertation. The primary keywords include self-medication, natural products, disease outbreaks and developing countries. Additional keywords such as those derived from synonyms were also used during the database search. Therefore, the initial search strategy was "*self-medication AND natural products or traditional medicine or complementary or alternative medicine or herbal medicine AND disease outbreaks AND developing countries*" following Robb & Shellenbarger's (2014) guide on the use of Truncation and Boolean operators. Synonyms for the search keywords were also generated and used (Appendix 3).

## 6.0 LITERATURE IDENTIFICATION

Following the article titled 'Guidance on conducting a systematic literature review' by Xiao & Watson (2019) in this dissertation, MEDLINE, The Allied and Complementary Medicine Database, Academic Search Complete and APA PsycINFO, Social Sciences Full Text (H.W. Wilson) and SocINDEX databases covering psychological, educational, social and health-related disciplines included within the UCLan library catalogue accessed via EBSCOhost were searched as they cover diverse published articles within the academic field relevant to the research question (Appendix 3). However, being a modified systematic literature review, which does not strictly examine only peer-reviewed academic and research materials within the subject area, grey literature such as textbooks, dissertations, preprints, government, and organisations websites etc., hand searching of referenced materials (backwards and forward search) were also conducted. Google Scholar being among the most frequently used databases by researchers and scholars (Xiao & Watson, 2019) also helped to provide grey literature (Appendix 2).

## 7.0 SCREENING FOR QUALITY AND INCLUSION

Following recommendations by Mengist et al. (2020) on the need to screen database search results before inclusion in a systematic literature review, all identified articles were collated, and their abstracts were assessed for relevance to the research question. Those found to be relevant were further assessed for quality by having a thorough read through the full text with special consideration given to journal articles and published books, being regarded as high-quality literature. However, a standardised critical appraisal was used to rapidly ascertain the quality of the articles. Relevant grey literature with well-cited references were also included. Only articles published in English language were included. Articles related to alcohol, drug addiction, and substance abuse were excluded. Included articles met the following criteria: (1) address self-medication with at least one form of natural product; (2) within the geographical context of at least one developing country; and (3) in relation to a disease outbreak.

## 8.0 DATA EXTRACTION

Adopting Ayaz et al. (2021) data extraction technique, a digital data extraction form developed using a Microsoft word table was used to guide the retrieval and sorting of data from the included articles. From each article, four (4) topical themes were extracted in relation to self-medication with one or more forms of natural products in developing countries during a disease outbreak viz: (1) sources of natural products utilised (2) associated factors or determinants, (3) implications and (4) solutions. The following primary information were extracted from each article: reference and citation details, study location, study design, the prevalence of self-medication, disease outbreak, forms of natural products used and topical theme of the article (Appendix 5).

## 9.0 DATA ANALYSIS

Adopting the mixed method approach used by Carroll et al. (2020) to analyse the extracted data of their study, each article in this dissertation was systematically assessed to identify, group, and compare any reoccurring themes whilst using descriptive statistics, a

quantitative synthesis of the included research was carried out and results presented. Also, Narrative synthesis was performed where the heterogeneous nature of the study deterred any form of data pooling for quantitative synthesis.

## 10.0 QUALITY AND BIAS ASSESSMENT

Using the AXIS critical evaluation technique designed for cross-sectional research as detailed by Parvizi et al. (2023), the quality and risk of bias of each included study were assessed. The studies were evaluated based on the following criteria: inclusion of clearly defined objectives; the suitability of the study design; the use of appropriate sample size; participants' response rate; response-associated bias; the internal consistency of the study findings; the justification of findings in the discussion and conclusion; acknowledgement of the study limitations; declaration of conflicts of interest/funding; and appropriate ethical consideration of the study among others. The AXIS critical evaluation tool is made up of 20 questions, each question is allocated a score (Y=Yes=1; N=No=0; NR=Not Reported=0). The score is in response to the question asked, a checklist scores a 'Yes' which equals '1' if the study exhibits a good quality on that question and a 'No' or 'Not Reported' which equals '0' if the study does not exhibit a good quality on the question. In the end, the 'Yes' are counted and summed up to obtain the final score over 20 (Ayosanmi et al., 2022) which gives an insight into the overall quality of the study.

## 11.0 PRISMA REPORTING

To find the answers to the research question in this dissertation, a systematic literature review protocol thoroughly reviewed all relevant articles published on the topic using a variety of inclusion and exclusion criteria to identify the articles included in the review, upon which the dissertation findings were made. To effectively report this protocol, the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) as detailed by Salameh et al. (2020) was used. PRISMA is a checklist with a four-phase flow diagram used for reporting the identification, screening, eligibility, and inclusion criteria of the articles that fell under the purview of the dissertation research question. It aids in facilitating transparency and clarity in reporting systematic literature review protocols, enabling a detailed and structured report that accurately identifies the final records of articles used in the dissertation.

## REVIEW OF LITERATURE

### 1.0 BACKGROUND

To ensure adequate background information on the research question, a scoping exercise was initially carried out to identify current relevant literature. To justify the need for this, Peters et al. (2020) while citing the Canadian Institutes of Health Research concedes that scoping reviews are vital exploratory activities that systematically map current published literature on a topic or research question to identify key concepts, evidence sources and research gaps. Tricco et al. (2022) echoed that rapid review synthesises knowledge by eliminating components of a standard systematic review process aimed at simplifying and streamlining the protocol thereby producing relevant information promptly. While Cooper et al., (2021), posit that scoping is a formative review which generates information that guides future research and studies. This chapter focuses on scoping the currently available literature on self-medication with natural products during disease outbreaks, and the underpinning conceptual and theoretical frameworks while highlighting the purpose of the review carried out in this dissertation.

### 2.0 CURRENT LITERATURE

The background search demonstrated that the concept and act of self-medication are ubiquitously reported in current literature (Kimathi et al., 2022). Alternatively referred to as self-treatment (Attah et al., 2020) and considered an element of self-care (Al-Worafi, 2020), it is characterised by not having due recourse to a doctor's advice (Iribhogbe & Odoya, 2021). Amongst several self-medicating agents, the use of natural products has been widely reported in the literature under a variety of terminologies. Pan et al., 2013 best described 'Natural products as medicinal remedies from Mother Nature, noting that 50% of modern therapeutics are derived from natural products.

### 3.0 ALTERNATIVE TERMINOLOGIES FOR NATURAL PRODUCTS

Regarding alternative terminologies, common examples are natural remedies (Abassi et al., 2020), home remedies (Hoi, 2020), natural health products (Health Canada, 2022) and natural medicine (Ren et al., 2023). Terminologies relating to its derivatives include traditional medicine (TM), herbal medicines (HM) (Ikram et al., 2023), complementary medicine (CM), and complementary and alternative medicine



(CAM) (Mulder et al., 2022) among others. The dominating natural product for self-medication in literature is herbal products from medicinal plants, whether during disease outbreaks (Malik et al., 2020; Quincho-Lopez et al., 2021; Kazemioula et al., 2022) or not (Maunder et al., 2020; Alzahrani et al., 2021; Heydarpour et al., 2022) as herbal medicines have been used since prehistorical times (Akhbarizadeh et al., 2023).

## **4.0 FACTORS ASSOCIATED WITH NATURAL PRODUCT USE**

The background literature search shows a strong link between natural product use and culture (Ross, 2020; Suharti & Kartika, 2021), religion (Ainaet et al., 2020; Akhlaq et al., 2022) and the level of education of a people (El-Dahiyat et al., 2020; Lam et al., 2021). It also shows that women (Kretchy et al., 2022), middle-aged (Ahmed et al., 2020) and urban dwellers (Nguyen et al., 2021) are more likely to use natural products. In addition, there are indications that the use of natural products is basically for three main purposes viz; disease prevention (Huang et al., 2020), treatment (da Silva Antonio et al., 2020) especially for chronic diseases (Nguanchoo et al., 2023) and maintenance of health and wellbeing (Arabska, 2021).

## **5.0 NATURAL PRODUCT USE DURING DISEASE OUTBREAKS**

In terms of disease outbreaks such as epidemics and pandemics, literature shows a corresponding significant increase in the utilisation of natural products both for prevention and treatment purposes (Islam et al., 2020). The highest reports in the literature on natural products utilisation during a disease outbreak is during the Covid-19 pandemic, probably attributable to the immense popularity gained by herbal medicines such as CAM during the pandemic (Kristianto et al., 2022) exacerbated by social media, especially in developing countries (Alotiby, 2021; Musoke et al., 2021). The scoping review revealed that several pieces of research have been conducted to investigate the possible factors which immensely contributed to the increased use of natural products during the Covid-19 pandemic besides the notorious social media influences (Musoke et al., 2021) including advice from friends and family (Alonso-Castro et al., 2021), previous personal positive experiences with natural products (Nguyen et al., 2021), a strong belief of efficacy and being deemed safer than orthodox medicine (Pan et al., 2022) among others.

## **6.0 IMPLICATION OF NATURAL PRODUCT USE**

Despite its vital role in ensuring the health and well-being of humans since prehistoric times, few authors have called attention to the possible side effects of natural products used for general disease prevention and treatment (Alkhamaiseh & Aljofan, 2020) and the potential for abuse (Taylor, 2022). While there are ubiquitous reports of natural product use during the pandemic and the associated factors, there is a relative paucity of reports in this regard. As previously cited, self-medication with natural products during the pandemic was informed by self-perceptions (Akande-Sholabi et al., 2021), recommendations from families, relatives, friends, (Alonso-Castro et al., 2021) colleagues, and peers (Aslam et al., 2021), and the media especially social media (Wegbom et al., 2021) which increases the likelihood of misinformation and abuse leading to possible adverse effects, which cannot be overlooked.

## **7.0 REGULATION OF NATURAL PRODUCT USE**

Several reports in the literature advocates for and, echo the need for the regulation of natural product use by government and health departments (Malik et al., 2020; Pauzi et al., 2022). The dearth of reports on the implications of self-medication with natural products during the Covid-19 pandemic amongst these calls for regulation of natural products during the pandemic in the literature indicates that there are unresolved thoughts of the potential implications of natural products during the pandemic by researchers which is yet to be explored in depth.

### **7.1 THE ROLE OF WHO**

Moreover, a scoping review of 'grey literature' as a whole body, reveals the immense role of the WHO towards the utilisation of natural products to limit possible implications whether for self-medication or as a prescription from a qualified practitioner (WHO, 2013). The WHO also works with member countries to develop guidelines and standards for the use of traditional medicine, including guidelines for the safety, efficacy, and quality control of traditional medicines. These guidelines help to ensure that traditional medicines are produced, marketed, and used safely and effectively through appropriate regulations.

## 7.2 REGULATION EFFORTS IN CHINA

In this vein, a white paper report from the Chinese government detailed the passing into law in 2016 the regulation of TCM, which provides guidelines for the development, production, and distribution of TCM products (China's State Council Information Office, 2016). The law also establishes a regulatory framework for TCM practitioners and sets standards for clinical research on TCM. The National Administration of Traditional Chinese Medicine (NATCM) is the government agency responsible for overseeing the regulation of TCM in China (Government of Hunan Province, 2020). It is responsible for the registration and certification of TCM practitioners, the approval and monitoring of TCM products, and the promotion of TCM both domestically and internationally.

## 7.3 REGULATION EFFORTS IN NIGERIA

In Nigeria, the government has taken steps to regulate traditional and herbal medicine in the country. In 2014, the National Institute for Pharmaceutical Research and Development (NIPRD) was given the mandate to regulate and promote traditional medicine in Nigeria (Voice of Nigeria, 2021). In addition, the government also established the Nigerian Traditional Medicine Practitioners Council (NTMPC) to oversee the registration and licensing of traditional medicine practitioners in the country (Nigerian Economic Summit, 2007). Furthermore, it enacted laws to regulate the sales and use of herbal medicines in the country regulated by the National Agency for Food and Drug Administration and Control (NAFDAC) also responsible for regulating the quality, safety, and efficacy of herbal medicines in Nigeria (Nigeria Ministry of Health, n.d.)

## 7.4 REGULATION EFFORTS IN SAUDI ARABIA

In 2017, the Saudi Food and Drug Authority (SFDA) announced new regulations for traditional and herbal medicine, which require all traditional and herbal medicines to be registered with the authority before they can be sold in the country (SFDA, n.d). The regulations also set standards for the manufacturing, labelling, and advertising of traditional and herbal medicines. The government has also established the National Center for Complementary and Alternative Medicine (NCCAM), which promotes research and education in traditional and complementary medicine (NCCAM, n.d.). The society also offers training programs for traditional medicine practitioners and helps to develop guidelines for the practice of traditional medicine in the country.

## 7.5 REGULATION EFFORTS IN INDIA

Like the Chinese government, the Indian government has a long history of using and regulating traditional and herbal medicine, known as Ayurveda (Food Safety and Standards Authority of India, 2022). The Ministry of AYUSH (Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homeopathy) is the government agency responsible for promoting and regulating Ayurvedic medicine in India. It is responsible for developing policies, standards, and guidelines for the education, research, and practice of Ayurveda and other traditional systems of medicine. In addition, the government has also encouraged the integration of Ayurvedic medicine with Western medicine (Indian Ministry of Defence, 2022). Many hospitals in India now offer both Ayurvedic and Western medical treatments, and the government has established a National Ayush Mission to promote the integration of traditional and modern medicine.

In this light, the WHO has also established a Traditional Medicine Strategy, which outlines its approach to traditional medicine and sets out a framework for integrating traditional medicine into national healthcare systems (WHO, 2022).

## 8.0 CONCEPTUAL AND THEORETICAL FRAMEWORKS

Self-medication was earlier defined as a form of self-care, a behaviour characterised by self-treatment without due consultation or advice from a qualified medical practitioner. In this subsection, the Modified Andersen model and Theory of Planned Behaviour will be used as a conceptual and theoretical framework respectively for the understanding of self-medication. To justify the need for a framework in this dissertation, Luft et al., 2022 posited that researchers need to consider conceptual and theoretical frameworks as vital components of the research and writing process, as they help to clarify, explain, and interpret the studied phenomenon, which is self-medication in this context.

### 8.1 MODIFIED ANDERSEN MODEL FOR SELF-MEDICATION

A conceptual understanding of self-medication as a human behaviour was proposed by Lei et al., 2018 while adopting and modifying the renowned Andersen model of health service utilisation (Andersen, 1995). The Conceptual framework of the modified Andersen model by Lei

et al., 2018 (Appendix 4; Figure 4) assessed people's behaviour towards self-medication applicable to natural products in order to form a conceptual understanding of the act of self-medication while assessing three pivotal factors viz; the individual's predisposition, enabling factors and need factor. It identifies the influences of demographic and social factors as predisposing factors; availability of health insurance and medical service, cost-income factors etc as enabling factors; perceived self-medication needs, and severity of a prevailing illness or disease as need factors, in this regard. These pivotal factors culminate in self-medication behaviour in people which then invokes countermeasures and suggestions according to Lei.

## **8.2 THEORY OF PLANNED BEHAVIOUR FOR SELF-MEDICATION**

The Theory of Planned Behaviour (TPB) developed by Icek Ajzen (Ajzen, 1991) (Appendix 4; Figure 5) can be applied to the topic of self-medication with natural products. According to TPB, behaviour is influenced by three factors: attitudes, subjective norms, and perceived behavioural control. Attitudes refer to an individual's positive or negative feelings toward the behaviour. In the context of self-medication with natural products, attitudes might be influenced by beliefs about the effectiveness and safety of natural products. Individuals who believe that natural products are effective and safe may have more positive attitudes towards self-medication with these remedies.

Subjective norms refer to the social pressures to engage or not engage in a particular behaviour. For self-medication with natural products, subjective norms may be influenced by the beliefs of family, friends, or healthcare professionals. If an individual's social network supports the use of natural products, they may be more likely to engage in self-medication. Perceived behavioural control refers to an individual's belief in their ability to perform the behaviour. For self-medication with natural products, perceived behavioural control might be influenced by factors such as knowledge about herbal remedies, access to herbal products, and confidence in the ability to correctly use the remedies. Individuals who feel that they have the necessary knowledge and resources to self-medicate with herbal remedies may be more likely to engage in this behaviour.

In summary, the Theory of Planned Behaviour suggests that attitudes, subjective norms, and perceived behavioural control all play a role in an individual's decision to self-medicate with natural products. Health professionals can use this framework to understand and address factors that may influence people's behaviour related to self-medication with natural remedies.

## **9.0 THE PURPOSE OF THIS REVIEW**

The purpose of this systematic review is to critically synthesise the literature on the implications of self-medication with natural products during disease outbreaks. To guide this synthesis, the review aims to answer the following questions from the main research question: (1) what is the state and quality of evidence in current literature? (2) what are the gaps in the literature (3) what are the determinants and contributing factors? (4) what are the implications and (5) what are the possible solutions? The review will conclude with the synthesis of recommendations for the research question.

## **RESULTS**

### **1.0 BACKGROUND**

In this chapter, findings from the review will be detailed. Findings regarding the state and quality of evidence in current literature and gaps will be presented. The determinants and contributing factors, implications, and possible solutions to self-medication with natural products during disease outbreaks will be presented.

### **2.0 SEARCH RESULTS AND STUDY SELECTION**

The initial search yielded a total of 1,683 records, with 1,380 identified records from Google scholar, 137 records from MEDLINE, 109 records from Academic search complete, 28 records from APA PsychInfo, 10 records from SocINDEX, 10 records from AMED, and 9 records from Social sciences Full Text. On uploading the search results to the RefWorks reference manager, 453 duplicate records were removed yielding 1,230 articles. Then the abstracts of the articles were screened for eligibility, and 857 articles were removed as unrelated to self-medication. Of the 373 resulting articles, the full text of 38 articles was non-retrievable. Therefore, the articles assessed against the selection criteria were 335. Among these, 117 articles were excluded as unrelated to any natural product use, 64 articles were outside the geographical context of developing countries, 98 articles were unrelated to disease outbreaks and 18 articles were not published in English resulting in 38

articles. After the review of full texts, 18 articles were excluded, resulting in the inclusion of 20 articles which were included in the final review. A PRISMA flowchart of the systematic review process is presented in Appendix 1, Figure 1.

## **3.0 STUDY QUALITY AND BIAS RISK**

As reported below, the majority (14) of the articles whose full text were reviewed, were cross-sectional studies, due to time constraints only these articles were assessed for quality and bias using the AXIS critical evaluation technique designed for cross-sectional research (Appendix 7). Overall, 71.4% of the 14 articles accrued 15 or more points over the 20 points system in AXIS evaluation tool. The lowest score was 9 points by Ismail & Al Hashel, 2021 and the highest point recorded was 19 with 2 articles by Nguyen et al., 2021 and Amuzie et al., 2022.

### **3.0.1 GENERALISABILITY**

Half (50%) of the 14 articles administered their data eliciting tools (e.g. questionnaires) online (i.e. online surveys), thus scoring No points for assessment parameters 5 and 6 (Appendix 7), thereby suggesting that these studies' overall findings may not represent the actual population, thus limiting the generalisability of their findings. Regarding the generalisability of the studies, the majority (8) of the articles did not clearly define or justify their sample size.

### **3.0.2 RESPONSE-BIAS**

The majority (9) of the articles did not report or describe the participants' response rate or categorise or put measures in place to address non-response rate, therefore scoring No points for either assessment parameters 13 and 14 or 7 (Appendix 7), thus signalling the possibility of response-bias in these studies.

### **3.0.3 ETHICAL APPROVAL AND CONSENT**

The majority (12) of the articles provided details regarding ethical approval and participants' consent before or during the studies. However, it was not reported if participants were informed of their rights to opt out of the study at any point if they felt uncomfortable.

## **4.0 STUDY CHARACTERISTICS**

This subsection presents the characteristics of the reviewed articles while noting important findings.

### **4.1 STUDY TYPES**

Among the 20 articles whose full text made the final review, 19 utilised primary data and were published journal articles, while 1 utilised secondary data and is an unpublished dissertation. Also, 15 articles employed quantitative methodology, 4 employed qualitative methodology and 1 mixed method. Among these, the majority (14) articles were cross-sectional studies, 2 articles were In-depth Interviews, 1 Case-control, 1 Literature review, 1 Narrative synthesis and 1 Focused group discussion (Appendix 6).

### **4.2 NUMBER OF PARTICIPANTS**

The number of article participants ranged from 16 (Mwangomilo, 2021) to 1,704 (Kladar et al., 2022) with 2 articles whose number of participants was not clearly defined (Thebe, 2022 and Aprilio & Wilar, 2021).

### **4.3 PERCENTAGE UTILISATION OF NATURAL PRODUCTS**

The percentage utilisation of natural products per article ranged from 15.5% in an article with 97 participants (James et al., 2020) to 100% in an article with 16 participants (Mwangomilo, 2021). However, 2 articles did not report the number of participants' utilisation (Thebe, 2022 and Aprilio & Wilar, 2021) of a natural product.

## 4.4 COUNTRIES

Among the 20 reviewed articles, 16 countries were captured including Kuwait, Mexico, Vietnam, Ghana, Saudi Arabia, China, Indonesia, Serbia, India, Turkey, Nigeria, Zimbabwe, Sierra Leone, South Africa, Tanzania, and Ethiopia.

## 4.5 DISEASE OUTBREAK

Among the 20 reviewed articles, the majority (16) reported on Covid-19, 2 articles reported HIV/Aids and the other 2 reported on Ebola.

## 4.6 NATURAL PRODUCT UTILISED

Among the 20 reviewed articles, the majority (13) reported Herbal Medicine (HM) use, 3 reported Complementary and Alternative Medicine (CAM), 2 reported Traditional and Complementary Medicine (T&CM) and 2 reported Traditional Medicine (TM)

## 5.0 THEMES

From the final 20 articles, 4 topical themes were extracted in relation to self-medication with one or more forms of natural products in developing countries during disease outbreaks viz: (1) sources of natural products (2) associated factors or determinants, (3) implications, and (4) solutions. Upon final full-text review, only three (3) articles mentioned one or more sources (theme 1) of natural product use during a disease outbreak. However, all (20) articles mentioned at least three or more determinants or contributory factors (theme 2) to natural product use. Only six (6) articles mentioned one or more implications (theme 3) of natural product use during a disease outbreak. And seven (7) articles proposed one or more solutions (theme 4) to natural product use during a disease outbreak.

### 5.1 THEME ONE: SOURCES OF NATURAL PRODUCTS

Among the three (3) articles that mention the source of natural products used by the study participants, personal gardens, herbal drugstores and traditional medicine hospitals or herbalists (Nguyen et al., 2021; Tran et al., 2021) are the most frequently mentioned. Others include friends and relatives, public markets and, ordered over the TV or Internet.

### 5.2 THEME TWO: ASSOCIATED FACTORS OR DETERMINANTS

As earlier stated, all (20) articles mentioned more than three associated factors or determinants which influence the use of natural products during a disease outbreak (Appendix 5). These factors can be broadly categorized into seven themes, which are demographic, personal, ideological, acquisitional, personal belief and opinions, and external, and health-related factors.

#### 5.2.1 DEMOGRAPHIC FACTORS

Demographic factors include age, race, ethnicity, gender, marital status, income, education, urban dwelling, and employment (Alonso-Castro et al., 2021; Nguyen et al., 2021; Alotiby et al., 2021; Kretchy et al., 2022; Nuertey et al., 2022; Kristianto et al., 2022; Kladar et al., 2022; Erarslan & Kültür, 2021; Tran et al., 2021; Amuzie et al., 2022; Thebe, 2022; James et al., 2020; Hughes et al., 2012; Shiferaw et al., 2020). These factors were found to significantly influence the use of natural products during a disease outbreak, as people from different demographic backgrounds may have different levels of access to information and resources related to natural products. The most frequently reported demographic factors with the most relevant influences in order of significance were gender, marital status, and urban dwelling.

#### 5.2.2 PERSONAL FACTORS

Personal factors, such as previous personal experiences, absence of health insurance, having children, having adequate knowledge, and the need to pursue a livelihood, were found to affect the use of natural products during a disease outbreak (Ismail & Al Hashel, 2021; Alonso-Castro et al., 2021; Thebe, 2022; Nguyen et al., 2021; Kristianto et al., 2022; Hughes et al., 2012). These were found to interrelate with other factors which influence people's perceptions of the efficacy and safety of natural products and their ability to access and afford them. The most frequently reported personal factors with the most relevant influences in order of significance were previous personal experiences, having adequate knowledge and the absence of health insurance.

### **5.2.3 ACQUISITION FACTORS**

Acquisition factors, such as ease of accessibility, availability, and affordability, are also important determinants of the use of natural products during a disease outbreak (Nguyen et al., 2021; Tran et al., 2021; James et al., 2020). It was discovered that when natural products are easily accessible, available, and affordable, people were more likely to use them. The review could not ascertain the most significant acquisition factors as all three were found to be present within the study articles concurrently.

### **5.2.4 IDEOLOGICAL FACTORS**

Ideological factors, such as religion, culture, and tradition, were found to play an immense role in the use of natural products during a disease outbreak (Kristianto et al., 2022; Mwangomilo, 2021; Shiferaw et al., 2020; James et al., 2020). People's beliefs and values especially those forming part of their identity and norms concerning health and medicine were found to have significant influences on their use of natural products and their willingness to try conventional medical treatments. As in acquisition factors, the review could not ascertain the most significant ideological factors for similar reasons.

### **5.2.5 PERSONAL IDEAS AND THOUGHTS**

Like ideological factors, personal ideas and thoughts were found to play a significant role as well. Being used over generations, considered natural, a strong belief of efficacy, deemed safe, having considered having magical health reliefs, considered a holistic approach to health, having low side effects, hospitals considered unsafe, mistrust of western medicines and institutions, conspiracies theories about vaccines and ease of talking to a T&CM practitioner and perceived ineffectiveness of conventional medicine were found to promote the use of natural products during a disease outbreak (Kurniasih & Juwita, 2021; Mwangomilo, 2021; Tran et al., 2021; James et al., 2020; Aprilio & Wilar, 2021; Erarslan & Kültür, 2021; Kristianto et al., 2022; Shiferaw et al., 2020; Thebe, 2022). The most frequently reported personal factors with the most relevant influences in order of significance were considered natural, strong belief in the efficacy and were deemed safe.

### **5.2.6 EXTERNAL FACTORS**

External factors, such as advice from friends, family influence, published articles, health care staff, internet (YouTube/ google), media (e.g., TV, Radio, Newspapers, and social media), and non-availability of drugs at health care facilities, may also affect the use of natural products during a disease outbreak (Ismail & Al Hashel, 2021; Alonso-Castro et al., 2021; Nguyen et al., 2021; Alotiby et al., 2021; Kretchy et al., 2022; AlNajrany et al., 2021; Kurniasih & Juwita, 2021; Aprilio & Wilar, 2021; Nuertey et al., 2022; Kristianto et al., 2022; Kladar et al., 2022; Mwangomilo, 2021; Erarslan & Kültür, 2021; Tran et al., 2021; Amuzie et al., 2022; Thebe, 2022; James et al., 2020; James et al., 2020; Hughes et al., 2012; Shiferaw et al., 2020). People were found to be more likely to use natural products if they receive recommendations from trusted sources or if conventional treatments are not readily available. The most frequently reported external factors with the most relevant influences in order of significance were friends and family influence, social media and the non-availability of drugs at healthcare facilities.

### **5.2.7 HEALTH-RELATED FACTORS**

Health-related factors, such as mental illness, COVID-19 positivity, other health comorbidities, high risk of COVID-19, fear of isolation, fear of stigmatization, death of a colleague, chronic disease, perception of poor health status, and need for immune system boost, were associated with and found to influence the use of natural products during a disease outbreak (Kretchy et al., 2022; Kristianto et al., 2022; Erarslan & Kültür, 2021; Thebe, 2022; Amuzie et al., 2022; James et al., 2020). People were found to turn to natural products to manage symptoms or prevent infection by boosting their immune system in the face of a disease outbreak. The most frequently reported health-related factors with the most relevant influences in order of significance were being COVID-19 positive, fear of isolation and stigmatization, and perception of poor health status.

## **5.3 THEME THREE: IMPLICATIONS OF NATURAL PRODUCT USE**

The common implications of natural products used during disease outbreaks include Diarrhoea, Stomach pain, Sweating, Headache, and Nausea/vomiting (Alonso-Castro et al., 2021; Alotiby et al., 2021; Kurniasih & Juwita, 2021). These side effects are typically mild and self-limiting and may not require medical attention in most cases. Others include Drowsiness, Dizziness, Hunger, Fatigue/tiredness, Coughing and Sneezing. Severe conditions include Anxiety, Tremors, Insomnia, Hallucinations, Anger, Depression, Gastritis, Constipation, Hypotension, Hyperglycaemia, Itching, difficulty in breathing, and unexplained effects (Alonso-Castro et al., 2021; Thebe, 2022; Alotiby et al., 2021; Kurniasih & Juwita, 2021). Other issues found were higher frequency and severity of symptoms (Ismail & Al Hashel, 2021), interaction with

other medication (Aprilio & Wilar, 2021)) and less communication with physicians (Ismail & Al Hashel, 2021). One study by Nuerter et al., 2022 shows that steam inhalation and herbal baths increased the risk of COVID-19 infection.

## 5.4 THEME FOUR: SOLUTIONS TO SELF-MEDICATION WITH NATURAL PRODUCTS

A reoccurring solution proposed for self-medication with natural products during disease outbreaks is public enlightenment phrased as public health campaigns by Alonso-Castro et al., 2021, Public awareness campaigns by AlNajrany et al., 2021, health education to the society, health promotion and education by Aprilio & Wilar, (2021), and public education by James et al., 2020. Kretchy et al., 2022 echoed the public health policy on CAM advocating for only clinically approved and validated CAM for use by the public. Supported by Aprilio & Wilar, (2021), they called for more research into the development and standardisation of natural products by identifying and isolating the active components of these products. In this vein, Aprilio & Wilar, (2021), went further to advise the inclusion of local wisdom through ethnomedicine during health promotion and education.

## DISCUSSION

Self-medication with natural products is a human behaviour which poses a major public health challenge across several countries. However, unlike self-medication with over-the-counter (OTC) medications which attract the most attention in published literature, natural products hold significant health implications, especially when used during times of disease outbreaks characterised by fear, anxiety, depression, and irrational thinking. The findings from this modified systematic literature review shed light on the focus of current literature on the factors and determinants of self-medication with natural products during disease outbreaks with little attention being paid to investigating the implications of the act.

While it is important to acknowledge the determinants of the behaviour, it is very paramount that the implications are made known and given public attention to help those possibly affected and suffering in silence. This is reflected in one of the findings in this review by Ismail & Al Hashel (2021) that participants who practised self-medication with natural products during the Covid-19 pandemic were withdrawn and had less communication with their physicians, as such, possible side effects were not reported. According to Vickers et al. (2006), participants in their study claimed to refrain from reporting the side effects of their herbal medicine use to their doctors due to the negative response they might get in return. However, no newer study was found to corroborate this claim. On the other hand, when appropriately considered, this could account for the current paucity of reports in the literature on the implications of natural products used during the pandemic.

In this review, one identified contributory factor to self-medication with natural products during the pandemic is the presence of several conspiracy theories about Covid-19 vaccines (Thebe, 2022). While this presents as a contributory factor, by extension this stands as an implication of self-medication with natural products in the form of vaccine hesitancy. A study by Kabakama et al., 2022 titled 'Commentary on COVID-19 vaccine hesitancy in sub-Saharan Africa' reported that in some countries such as Cameroon, Uganda, Sierra Leone and Tanzania, herbal medicine and steam inhalation is considered a more protective and curative alternative to vaccination due to discrepancies and misconceptions associated with the vaccination programme in these countries.

Regarding steam inhalation for preventing and treating Covid-19 in some developing countries, one study in this review by Nuerter et al., 2022 shows that steam inhalation and herbal baths increased the risk of COVID-19 infection. While the study did not report the possible reason for this finding, it reported that subgroup analyses of some home remedies for Covid-19 such as herbal steam inhalation and herbal baths were associated with an increased risk of Covid-19 infection (95% CI = 6.10–116.24 and 95% CI = 0.49–14.78 respectively). While steam inhalation is shown to increase the risk of Covid-19, a more worrying aspect of this practice is steam burns. A study by Brewster et al. (2020) titled 'Steam inhalation and paediatric burns during the COVID-19 pandemic' shows that there was a 30% increase in the number of scalds resulting from steam inhalation in children as presented at the Birmingham Children's Hospital, in the UK.

Home remedies play a major role in the utilisation of natural products during disease outbreaks, this is fostered by persistent farming where personal gardening is identified as a reoccurring factor that encourages self-medication with natural products in this review. This is directly linked with the identified acquisition factors such as ease of accessibility, availability, and affordability (Nguyen et al., 2021), which in turn pose a considerable challenge for regulatory efforts by the government and health agencies in several developing countries (Adebisi et al., 2022) exacerbated by ideological factors such as religion (Kristianto et al., 2022), culture and tradition (Aprilio & Wilar, 2021).

In addition, demographic factors were identified in the majority (14) of the articles reviewed. While this is not shocking as demographic factors have a proven association with health behaviour in literature (Zajacova et al., 2020; Choi et al., 2021), the review showed some interesting findings. For example, females were found to self-medicate with natural products more than the male (Alonso-Castro et al., 2021; Kretchy et al., 2022; AlNajrany et al., 2021; Nuerthey et al., 2022; Erarslan & Kültür, 2021; James et al., 2020; Shiferaw et al., 2020). The literature presents several reasons for these findings, Al-Hussaini et al. (2014) study in Kuwait showed that the female sex is more likely to self-medicate because, since their teenage age, they are used to self-medication for menstrual pains. Concerning the Covid-19 pandemic, Heemskerk et al. (2022) observed in their study that the female sex is more likely to feel more at risk of Covid-19 than their male counterparts. In this vein, Coman et al. (2022) posit that the female sex is more likely to seek social media guidance and follow through with advice from digital media. Moreover, this review repeatedly sighted the influence of social media as a contributor to self-medication with natural products during the pandemic (Alotiby et al., 2021; Kretchy et al., 2022; Nuerthey et al., 2022).

A seemingly interesting finding from the review is the higher prevalence of self-medication with natural products during the pandemic in urban areas than in rural areas. However, on careful examination, one would find that most of the studies were conducted on the internet as online surveys. With limited internet connectivity in rural areas, more participants' responses would be from urban areas, creating a form of selection bias (Lehdonvirta et al., 2021). While age did not show any significant difference with natural product use, young adults were more likely to self-medicate with natural products (Hughes et al., 2021). However, being married and having children are two significant factors which influenced the use of natural products during the pandemic (Nguyen et al., 2021; Nuerthey et al., 2022; Kristianto et al., 2022; Kladar et al., 2022; James et al., 2020; Hughes et al., 2021). A study by Tugume & Nyakoojo (2019) indicates that married couples and parents are driven to herbal medicine to protect their families due to a sense of duty and responsibility.

Findings from this review show that the major side effects of self-medication with natural products are Diarrhoea, Stomach pain, Sweating, Headache, and Nausea/vomiting according to Alonso-Castro et al., 2021 and Alotiby et al., 2021. It is worth noting that these are among the enlisted symptoms of drugs including herbal remedies overdose according to the Department of Health, Government of Australia (Department of Health, Australia 2021). The issue of overdose with natural products is ubiquitously reported in the literature, especially about herbal and traditional medicine which is probably because most herbal and traditional medicines especially home remedies lack appropriate dosage indications (Zhou et al., 2019).

According to Alonso-Castro et al., 2021 in this review, diarrhoea is a common side effect of many natural products used for self-medication, and it can be caused by a variety of factors. Some herbs, such as aloe vera and senna, have laxative effects that can cause diarrhoea (Ashfaq & Yousaf, 2022). Alotiby et al., 2021 identified Stomach pain in this review as a major side effect of herbal medicine use, particularly if the herbs are taken on an empty stomach or in large amounts, a finding corroborated by Tripathi & Bahuguna (2022). Sweating, headache, and nausea/vomiting are other common side effects of natural products cited in this review by Alonso-Castro et al., 2021, Alotiby et al., 2021 and Kurniasih & Juwita (2021). These side effects may be due to the active ingredients in the herbs or to an allergic reaction (Suntar, 2020). In this review, Kurniasih & Juwita (2021) observed some natural products can interact with other medications, so it is important to consult with a healthcare provider before using any herbal remedies, particularly when taking other medications (Nugraha et al., 2020).

Severe side effects of natural product use can be a cause for concern and may require immediate medical attention. For example, in this review a study by Alonso-Castro et al., 2021 identified anxiety and tremors, as common symptoms of an adverse reaction to some herbs, and in some cases, these symptoms can be severe enough to require hospitalization. Alonso-Castro et al., 2021 also identified insomnia, hallucinations, and depression as other severe side effects that can be caused by herbal medicines, especially if they are taken in high doses or used improperly (Tripathi & Bahuguna, 2022). Another study in this review by Aprilio & Wilar, (2021) observed that it's important to note that some herbs can interact with prescription medications, leading to severe side effects, such as hypotension, hyperglycemia, and constipation, a finding corroborated by Kim et al., 2021. Also in this review, Kurniasih & Juwita (2021) observed that herbs can also cause itching and breathing difficulties, which can be dangerous for people with asthma or other respiratory conditions. Therefore, it is important to keep in mind that even natural remedies can have side effects and can be toxic if taken improperly or in excess.

## **CONCLUSION, LIMITATIONS AND RECOMMENDATIONS**

### **6.0 BACKGROUND**

This chapter brings into the foreground the overarching relevance of the dissertation. It summarises the key findings in relation to the dissertation research question which framed the aims and objectives, as well as the value and contribution of the study, its limitations and recommendations. The study was done using a modified systematic literature review methodology renowned for being the bedrock of evidence-based medicine, capable of synthesising high-quality and trustworthy research findings. The search protocol utilised for the search



and selection of relevant materials from literature used in synthesising the findings of the study was documented using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA). Overall, 71.4% of the 14 articles assessed for quality and bias accrued 15 or more points over the 20 points system in AXIS critical evaluation tool, indicating that they were relatively of good quality.

## **6.1 CONCLUSION**

The dissertation aimed to determine the implications of self-medication with natural products during disease outbreaks among people in developing countries. The results indicate that despite the paucity of studies centring on the implications of natural product use, the common side effects are Diarrhoea, Stomach pain, Sweating, Headache, and Nausea/vomiting, among others. Other notable implications are higher frequency and severity of disease symptoms, interaction with other medication and difficulty in breathing. One study revealed that steam inhalation and herbal baths increased the risk of COVID-19 infection. The study found that people who self-medicate with natural products tend to withdraw and had less communication with their physicians, thereby hampering the report of side effects to their doctors, which by extension might account for the current paucity of reports in the literature. As previously reported in the literature, this study revealed that herbal medicine is the main type of natural product used for self-medication and the primary source is personal gardening, thereby making home remedies the most frequently practised form of self-medication during disease outbreaks as opposed to visiting herbal practitioners. The study found several factors which influenced the use of natural products for self-medication, broadly categorized into seven themes, which are demographic, personal, ideological, acquisitional, personal belief and opinions, and external, and health-related factors. Among these, ideological and acquisitional factors were found to have the strongest influence on self-medication with natural products during disease outbreaks. These findings were mostly consistent with the initial background scoping done in the study which highlights the need for more exploration of the implications of self-medication with natural products amongst its various determinants and contributing factors.

In conclusion, this dissertation shows that there are implications of self-medication with natural products during disease outbreaks which are likely not to be reported by those who practise the act, which might be due to fear of negative response and reactions from others. Also, while the call for regulation of natural products is vital to curbing the act, actions and efforts need to be made to encourage those suffering from the implications of self-medication with natural products to openly seek help without prejudice and possible stigmatisation.

### **6.2.0 LIMITATIONS**

As with all research, this dissertation has its limitations all of which will be acknowledged and briefly discussed. Overall, this dissertation employed twenty (20) articles in the systematic review, thus the findings should be interpreted with caution due to limitations with its generalisability. Although there is no universal consensus on the minimum sample size for systematic literature review studies (Farhad, 2022), Paul & Criado, 2020 recommend the inclusion of 40-50 to 500 relevant studies. This is however not possible due to time constraints for this dissertation. Regarding the assessed articles, half of them employed online surveys which has the limitation of not completely representing the actual population in these studies (Andrade, 2020). There are issues with the potential for bias as some of the assessed studies did not report or describe the participants' response rate or categorise or put measures in place to address the non-response rate (Zahl-Thanem et al., 2021). Thereby impacting on the overall significance of the findings in this dissertation.

### **6.3.0 SIGNIFICANCE OF THE STUDY**

This dissertation specifically identifies a gap in the literature regarding the implications of natural product use for self-medication during disease outbreaks and tries to fill the gap by specifically exploring relevant current literature whilst drawing attention to the problem and its public health importance. It identifies and provides inferred evidence of the possible suffering of people living with the negative implications of self-medication with natural products during disease outbreaks. It stimulates further research by identifying the need for more qualitative studies on the subject thereby encouraging people to speak out about the problem. This would therefore provide more knowledge from people's experiences and thus, help guide public health policies and the development of interventions in this regard.

### **6.4.0 RECOMMENDATION**

Among the possible solutions to the issue of self-medication with natural products found in this dissertation, the need for government and health agency regulation was identified as a key solution, especially with the efforts of the WHO in this regard. In the same vein, the need to promote the use of evidence-based natural medicinal products while strengthening research efforts towards identifying and isolating the

active medicinal components in natural products for public utilisation was also a major focus. In this dissertation, however, the following recommendations were proposed as inferred from other findings from the study.

## **6.4.1 PUBLIC ENLIGHTENMENT**

The most recommended solution to self-medication with natural products in this review is public enlightenment. Public enlightenment refers to the process of educating and informing the public about the risks and benefits of natural products, as well as the importance of seeking professional medical advice before using natural products. This can be done through various means, such as mass media campaigns, health education programs, and community outreach. These programs should focus on educating the public on the proper use of natural products, and the potential risks associated with self-medication while acknowledging and addressing the influence of ideological and acquisitional factors among others. In addition, public enlightenment can help to promote the use of evidence-based herbal medicine where available, thereby reducing the risks associated with self-medication and promoting better health outcomes.

## **6.4.2 UTILISATION OF LOCAL WISDOM THROUGH ETHNOMEDICINE**

Ethnomedicine is the study of traditional medical practices and beliefs that are used by various ethnic groups. Local wisdom through ethnomedicine plays a vital role in health as an important source of knowledge and practices that can be used to complement modern medical practices, especially in communities that have limited access to healthcare. One way in which local wisdom through ethnomedicine can be used is by integrating it into healthcare systems. This can be done by training healthcare professionals on the use of traditional medicine and incorporating it into their treatment plans. This way, people who strongly uphold ideological beliefs could go to such hospitals instead of self-medicating. In addition, local wisdom through ethnomedicine can be used to promote healthy lifestyle practices within communities.

## **6.4.3 BREAKING BARRIERS TO SEEKING HELP BY VICTIMS OF SELF-MEDICATION**

Efforts need to be made to encourage those suffering from the implications of self-medication with natural products to openly seek help without prejudice and possible stigmatisation. This can be achieved through various means, such as education, counselling, and support groups. Education is an important tool in breaking down stigmatisation and prejudice towards individuals who have engaged in self-medication. Educating healthcare professionals and the public about the reasons why individuals may engage in self-medication can help to increase understanding and empathy towards these individuals and promote better access to healthcare. Counselling and Support groups can also be beneficial by creating a sense of support and community and can help individuals to feel less isolated.

## **6.5.0 CALL TO ACTION**

To help in implementing these recommendations, this dissertation proposes the following strategies for key stakeholders to improve public health outcomes related to self-medication with natural products during disease outbreaks.

### **6.5.1 POLICYMAKERS**

#### **Strategy 1: Establish guidelines for healthcare professionals**

These guidelines can help healthcare professionals to integrate natural products into their treatment plans safely and effectively and can provide guidance on when to refer patients to specialists or other healthcare providers. These guidelines should be made available to healthcare professionals through their professional associations, conferences, and internal memos and integrated into healthcare courses for students.

#### **Strategy 2: Support research**

Policymakers can help allocate more funding for research on natural products by promoting collaboration between researchers, traditional medicine practitioners, and healthcare professionals to share knowledge and expertise by setting up stakeholders' symposiums, workshops, and town hall meetings.

## 6.5.2 HEALTHCARE PROVIDERS

### Strategy 1: Gather information about patients' use of natural products.

Healthcare providers can gather information from their patients about their use of natural products, including what products they use, how often they use them, and for what purpose by encouraging them to speak up. This information can help healthcare providers to identify potential interactions or side effects with other medications, and develop treatment plans that consider the use of natural products.

### Strategy 2: Incorporate natural products into treatment plans.

Healthcare providers can incorporate natural products into their treatment plans when appropriate, such as for pain management, anxiety, or other conditions. Healthcare providers can also work with patients to develop treatment plans that integrate natural products with conventional therapies, where appropriate.

## 6.5.3 COMMUNITY LEADERS

### Strategy 1: Provide education and information.

Community leaders can raise awareness among community members by organizing educational programs, workshops, and seminars to educate community members about the proper use of natural products and the potential risks associated with self-medication. These programs should also focus on the importance of seeking professional medical advice before using natural products.

### Strategy 2: Encourage local businesses to provide reliable information.

Community leaders can encourage local businesses that sell natural products to provide reliable information to their customers about the products they sell. This can include information on the ingredients, potential side effects, and interactions with other medications.

## 6.5.4 PUBLIC HEALTH PROFESSIONALS

### Strategy 1: Promote education and awareness

Public health professionals can develop educational materials and campaigns to raise awareness among the public about the risks and benefits of self-medicating with natural products, and the importance of seeking professional medical advice before using these products.

### Strategy 2: Conduct research and develop evidence-based guidelines

Public health professionals can conduct research to better understand the patterns and trends of self-medication with natural products and the potential risks and benefits associated with these practices. This research can help to inform public health policies and interventions. It can develop evidence-based guidelines for the use of natural products by working with healthcare providers and community thereby promoting the safe and effective use of natural products and improving public health outcomes.

In conclusion, by implementing these strategies, key stakeholders can help to promote the safe and effective use of natural products and can improve public health outcomes related to self-medication with natural products.

## Declarations

### ACKNOWLEDGMENTS

I would like to express my deepest gratitude to my dissertation advisor, *Chris Smith*, for his guidance, support, and mentorship throughout the entire process. His expertise, patience, and encouragement have been invaluable in shaping the direction and content of this dissertation. I am also grateful for his insightful comments, suggestions, and feedback on my work.

I would like to extend my appreciation to the staff and faculty of the School of Community Health & Midwifery for their support and encouragement throughout my studies. Their guidance and advice have helped me to grow as a researcher and scholar.

I am very grateful to **Andrea Jane Evans** a member of the UCLan Library Support Team for finding to support me during my literature search and **Christopher Bell** of the UCLan EAP and Academic Skills Development for his immense support in helping me to break the ice at the start of my dissertation.

I am also indebted to my family and friends, who have been a constant source of love, encouragement, and inspiration. Their unwavering support and belief in me have been crucial in my academic journey. Special thanks to my lovely wife (**Aniefiok Anita ADEBIYI**) for her love, patience, support, and motivation. And to my family for believing in me to sponsor and support my education abroad.

Finally, I would like to express my sincere gratitude to the several authors whose work I utilised directly and indirectly to synthesise the findings of this dissertation, without whom this dissertation would not have been possible. Like Robert Hooke in 1675, I said to myself, if I could successfully complete my first postgraduate study in the United Kingdom known for its high standard of rigorous learning, it is because am "*standing on the shoulders of Giants*".

Thank you all for your support, encouragement, and inspiration. This accomplishment would not have been possible without your unwavering support and guidance.

Competing interests: The author declares no competing interests.

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