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A Web Content Analysis of Saudi Arabia's Health Education Websites, Promotion, and Physical Activity: *A quantitative evaluation of the accuracy, transparency, readability, navigability of the internet-based information and materials about cardiovascular diseases websites in the Kingdom of Saudi Arabia*.

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DECLARTION

This work has not previously been accepted in substance for any degree and isnot being concurrently submitted in candidature for any degree.

Signed…….(candidate)

Date .....15/3/2022.....

This thesis is the result of my own investigations, except where otherwise stated.Other sources are acknowledged by footnotes giving explicit references.

A bibliography is appended.

Signed……..(candidate)

Date .....15/3/2022.....

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ABSTRACT

Background

Inadequate information, education and awareness concerning CVD are the reasons for the limited availability of CVD screening and management resources (WHO, 2021). The ability to access reliable CVD information online can help inform patient decisions regarding treatment and improve early detection rates. It is important to ensure that websites contain valid and reliable information about CVD. Research on the quality of the information provided by CVD websites in Saudi Arabia is limited, which is the research gap this study addresses.

Aim

To evaluate the accuracy, transparency, readability, and navigability of English-language websites that provide CVD information to patients in Saudi Arabia through quantitative research.

Method

The research method adopted in this study is a quantitative evaluation of 40 websites obtained from the first three pages of Google, Yahoo, and Bing. This study employed a screening tool as a questionnaire to collect data that was later analysed and presented using tables, charts, and descriptive statistics.

Findings

The .com domain websites were the most frequent (n=12) (30%) closely followed by those with a. med domain (n=11) (27.5%). Analysis of Accuracy score revealed that (n=26) websites had a score of zero, while (n=9) websites scored 72.72%, (n=1) website scored 31.81%, (n=1) website scored 18.18% and (n=1) website scored 4.54%, (n=2) websites scored 36.36%. Overall, 70% (n=28) of sample websites indicated transparency greater than 70%. All 40 websites analysed were

found to have good navigability in finding information related to CVD. The readability results highlight the average text level of the sampled websites is “easy”.

Conclusion and Recommendation

The study showed fluctuating levels of accuracy, transparency, readability, and navigability among the sample websites. Health professionals should have visibility into the latest websites with the highest standards to ensure patient decisions will be more informed and improved overall outcomes. This research also provided information that can be utilised to guide policymakers and stakeholders in Saudi Arabia in accordance with the Kingdom’s Vision 2030 strategic development plan.

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LIST OF ABBREVIATIONS

Abbreviation	Meaning
WHO	World Health Organization
HON	Health on the Net Foundation
FRE	Felsch Reading Ease
FKG	Felsch Kincaid Grade
TLD	Top Level Domain
AGL	Age Grade Level
JAMA	Journal of American Medical Association
ASL	Average Sentence Length
ASW	Average Syllables Word
CVD	Cardiovascular Diseases
NCDs	Non-Communicable Diseases
GCC	The Gulf Cooperation Council Countries
Medline (Ovid)	The National Library of Medicine's Bibliographic Database/Article Index
CASP	Critical Appraisal Skills Programme

NHS	The UK National Health Services
IHD	Ischaemic Heart Disease
BP	High Blood Pressure
OHI	Online Health Information
SD	The Standard Deviation
HPs	Health Professionals
LS	Lay Subjects
AF	Atrial Fibrillation
PEMAT	The Patient Education Materials Assessment Tool
AHI	Academic Hospitals Institutions
GMW	General Medical Website
AMA	American Medical Association
NIH	National Institutes of Health
SPSS	The Statistical Package for the Social Sciences
HM	Heart Murmur
CAC	Coronary Artery Calcium
OPEMs	Online Patient Educational Materials
ACC	American College of Cardiology

AHA	American Heart Association
RGL	Reading Grade level
SMOG	Simple Measure of Gobbledygook
FOG	Gunning Frequency of Gobbledygook
CLI	Coleman-Liau Index
GFI	Gunning Fog Index
NDC	New Dale-Chall Formula
NFC	New Fog Count
FRF	Fry Readability Formula
REE	Raygor Readability Estimate
HF	Heart Failure
ANOVA	Analysis of Variance
ARBs	Angiotensin Receptor Blockers
HBM	Health Belief Model
NICE	National Institute for Health and Care Excellence
KSA	Kingdom of Saudi Arabia
DM	Diabetes Mellitus
EKG/ECG	Electrocardiogram

EBCT	Electron-Beam Computed Tomography
MRIs	Magnetic Resonance Imaging
NIMH	National Institutes of Mental Health
LDL	Low-Density Lipoprotein
MOH	Ministry of Health
FKR	Flesch-Kincaid Reading Grade

CHAPTER 1 INTRODUCTION

1.0 Introduction

It is common for people to die from cardiovascular diseases (CVD) (Osokpo & Riegel, 2019). According to the World Health Organization (WHO), almost 18 million fatalities worldwide are due to cardiovascular disease annually (WHO, 2017). CVD accounts for 31% of deaths, making it the leading cause of death worldwide (Alhabib et al., 2020). This condition has also emerged as a significant health concern in the Gulf Cooperation Council countries (GCC), such as the Kingdom of Saudi Arabia (KSA), where it contributes to over 45% of all deaths (Alhabib et al., 2020). The common risk factors for CVD include hypertension, diabetes, obesity, physical inactivity, dyslipidemia, poor diet, smoking, and alcohol intoxication (Alhabib et al., 2020). These risks have increased in the Kingdom of Saudi Arabia due to rapid urbanisation, poor diet, and a sedentary lifestyle (Alhabib et al., 2020). It is paramount for the Kingdom of Saudi Arabia to facilitate interventions that could prevent CVD (Alhabib et al., 2020). The ability to access reliable online

information regarding CVD can help patients' treatment decisions and their overall understanding of their condition. It is important to ensure that websites contain valid and reliable information. There is limited research regarding websites that provide CVD information in Saudi Arabia. Therefore, the researcher carried out this study to identify the quality of CVD websites available for Saudi CVD patients.

1.1 Background

Cardiovascular diseases are a significant cause of death among non-communicable diseases (NCDs) worldwide (WHO, 2021; Gutierrez et al., 2018). About 39.5 million people died from NCDs in 2015, globally, and of these, 17.7 million were linked to CVD (Gutierrez et al., 2018). In 2019, there were 17.9 million deaths from CVD, which accounted for around 32% of all deaths worldwide (WHO, 2021). Heart attacks and stroke constituted about 85% of these deaths. Thus, they are the most notable CVD risk factors (WHO, 2021). In the same year, 17 million premature deaths (deaths of those under 70 years old) resulted from NCDs, with CVD accounting for 38% of this total (WHO, 2021). CVD has caused a significant rise in mortality and morbidity rates worldwide. CVD has placed notable pressure on the Saudi healthcare system and the professionals employed in it to act (Gutierrez et al., 2018). CVD risks are relatively high among Saudi Arabian women, but most also present physical inactivity (53.2%) and obesity (33.5%) (Alshaikh et al., 2016). Thus, in terms of self-care, it is important to note obesity is a contributory factor to cardiovascular disease and other health issues, such as Type 2 diabetes (Kubis et al., 2017).

Kubis et al. (2017) propose intervention tools available in the Kingdom of Saudi Arabia to self-manage and monitor their body weight and caloric intake to control their behaviours. The intervention tools included an information leaflet, a prompt card, and a commitment report form, which allowed the participants to lose sufficient weight and improve their food intake attitudes

(Kubis et al., 2017). Kubis et al.'s (2017) study focused on women in the Kingdom of Saudi Arabia, and it is possible that the interventions targeted women's health only and not on men's health. The risk of most CVD can be mitigated through lifestyle changes that help reduce risk factors. Risk factors include obesity, physical inactivity, smoking, alcohol usage and poor diet (WHO, 2021). Saudi Arabian culture encourages women to remain at home to look after their families (DeNicola et al., 2015). This cultural activity exposes Saudi women to an increased risk of developing CVD. The competing pressures of modernity, traditional Saudi culture and economic prosperity have also created an obesogenic environment that encourages sedentary lifestyles and poor diet, leading to weight gain, the major CVD risk factors in Saudi women compared to their western counterparts (DeNicola et al., 2015).

Turk-Adawi et al. (2017) determined that early CVD detection is worse in the Kingdom of Saudi Arabia than in Western countries. Consequently, at the time of diagnosis, over 40% of Saudi patients with CVD are over 50 years old compared to 23% in the same population cohort in Western countries (Turk-Adawi et al., 2017). Despite efforts to improve the early detection of CVD, over 70% of cases are diagnosed late, which increases the risk of death significantly (WHO, 2021). Indeed, approximately 50% of Saudi women present with advanced stages of CVD at diagnosis (Alshaikh et al., 2016).

There is a genetic susceptibility towards the more aggressive types of CVD among Saudi women. However, higher mortality rates compared with developed countries are also attributable to several additional factors (Turk-Adawi et al., 2017). These include limited public awareness, inadequate screening programs, deferred appointments, and a shortage of effective treatment options (Turk-Adawi et al., 2017). Fortunately, the Kingdom of Saudi Arabia is planning downstream, midstream and upstream interventions to reduce cardiovascular disease. Implementing this plan will involve

various interventions, including educating the younger population in health and lifestyle changes and raising awareness of available self-care activities (Tyrovolas et al., 2020). At the same time, adults would benefit from being informed of behavioural health risk factors (Tyrovolas et al., 2020). More importantly, the Kingdom of Saudi Arabia has acknowledged that health policy planning is a significant aspect in approving the proposed interventions (Tyrovolas et al., 2020).

1.2 Online Health Information

Many CVD patients use the internet to obtain information (Marar et al., 2019). It functions as a medium through which patients and medical professionals can exchange information (Alanzi & Al-Yami, 2019). The benefits of access to personal and general medical information online include improved treatment participation rates, a greater sense of control, and improved psychological wellbeing (Marar et al., 2019). Nevertheless, online CVD information can expose patients to contradictory and even misleading information and treatment options, resulting in confusion and anxiety (Alanzi & Al-Yami, 2019).

The possibility of quickly accessing the information on almost any subject has had significant results, especially regarding healthcare. Today, patients are better informed and more concerned about issues related to their health and treatment, thereby transforming the dynamic between patients and their clinicians (Alanzi & Al-Yami, 2019).

The internet has become the most commonly-used repository of medical information. The vast amount of online medical data is available, thereby becoming an important aspect in improving patient health and healthcare provision (Marar et al., 2019). The capacity to make an informed decision is dependent on the reliability and accuracy of the information available (Marar et al., 2019). However, virtually anyone can create a website offering what appears to be expert advice on different issues (Marar et al., 2019).

Medical professionals do not write most content on health information websites. There is limited legal and ethical regulation of these websites and their content (Almansour et al., 2020). This results in a problematic situation, wherein the available content may be misleading and/or harmful to patients, but they may not know (Almansour et al., 2020). Information of questionable provenance is more likely to have undesirable consequences for patients (Almansour et al., 2020).

Almansour et al. (2020) found that health information available online in Saudi Arabia is inadequate. Furthermore, information on health websites was fundamental, with no significant specific health information. Most websites in the Kingdom of Saudi Arabia provide information in the English language, which can prevent another barrier to access (Almansour et al., 2020). The (GCC), including the Kingdom of Saudi Arabia, have significant socio-economic and cultural diversity (Almansour et al., 2020).

1.3 Aim

- This study aims to quantitatively evaluate the accuracy, transparency, readability, navigability of the internet-based information and materials on English-language websites related to CVD in the Kingdom of Saudi Arabia. It is a web content analysis of Saudi Arabia's health education websites covering CVD prevention strategies such as health promotion and physical activity.

- The study intends to help improve patients' access to public health for Saudi internet users attempting to access CVD information. It develops insights about the standard of the information concerned with several elements, including accuracy, transparency, readability, and navigability. The evaluation is based on a screening tool developed by England and Nicholls (2004).

- To help improve health self-care services for CVD in accordance with the Kingdom's Vision 2030 strategic development plan, which indicates that all patients should be able to lead, and is aware of, their health self-care in regard to CVD.

- To assess the level of awareness of health promotion initiatives regarding preventative or health self-care services. Following are the objectives that will help achieve these goals:

1.4 Objectives

- To assess the accuracy of CVD health information available in the Kingdom of Saudi Arabia.

- To assess the transparency of each website through a critical review of the authorship, attribution, disclosure, currency, complementarity, and the implementation of kite marks as suggested by the Health on the Net Foundation Code (HON) (HON, 2020).

- To assess the readability of the text on the websites by employing Microsoft Word (2016) to test the Flesch Reading Ease score (FRE) and Flesch-Kincaid Grade (FKG) (Linney, 2017).

- To evaluate the websites' navigability regarding to the external links provided (Wojdynski & Kalyanaraman, 2015; Sandvik, 1999).

- To evaluate the quality of each website in terms of objective quantitative measures, including the accuracy, transparency, readability, navigability, understandability, and quality of health information and materials they provide related to CVD.

1.5 Dissertation Structure

Chapter One: the introductory chapter provides background information regarding CVD, the emphasis is on Saudi statistics, which are compared with the international literature. The first

chapter also examines how health information can be found on the internet based on the available research on this topic. Also, setting out the aims and objectives which guide the study.

Chapter Two: The Literature Review will be discussed in this chapter. The aim is to explore and critically examine existing research to help identify a research gap the current study can address. The chapter outlines the search strategy and explains the inclusion and exclusion criteria employed to filter the studies. The themes that emerged from the review of existing research are then presented. The chapter ends with a summary, which identifies the gap in the literature this study will fill.

Chapter Three: provides an overview of the methodology employed to conduct this research and the justification for utilising this approach. Moreover, as part of this discussion, the instruments used are also outlined.

Chapter Four: chapter four provides the evaluation results for selected websites via a narrative synthesis supported by tables and figures.

Chapter Five: discusses the study's results.

Chapter Six: the limitations and recommendations of this study, along with an overall summary of the research project, are provided in chapter six. This is the last chapter of this dissertation, and it takes a conclusion's form.

CHAPTER 2 LITERATURE REVIEW

2.0 Introduction

This chapter identifies and critiques relevant research on a particular topic (Amirah et al., 2015). It describes what this is chapter seeks to achieve. The ultimate research purpose is to contribute to understanding the issue under investigation (Jahan & Al-Saigul, 2017). Hence, the literature review is thematically organised into four themes:

1) The availability of online cardiovascular disease (CVD) information in the Kingdom of Saudi Arabia.
2) The value of the internet in educating Saudi Arabian patients and the broader public about CVD diagnosis and management.
3) Factors are hindering technological acceptance of CVD information obtained from English-language websites in the Kingdom of Saudi Arabia.
4) Online health messages for Saudi Arabian patients.

The research strategy is described, with a theoretical critique utilised, followed by an overview of the methodological critique and a thematic analysis of the four themes. Finally, a summary of the chapter is provided.

2.1 Search Strategy

To find relevant research on websites that provide information on (CVD) in different countries, a search was conducted systematically using PubMed, Medline (Ovid), Google Scholar, and Cochrane online databases. The references of the identified studies were also manually reviewed to determine additional articles missed by the electronic search (Smith et al., 2018). Exclusion criteria for full-text articles were applied to all databases except English as the primary language (Clarke et al., 2013).

Some of these papers were excluded due to their relevance to the study's aims or lacked transparent methodologies or techniques (focusing on one or more cases), conference papers (since they are subject to revision before final publication), and review articles. Literature relevant to examining the quality of online information in the Kingdom of Saudi Arabia was reviewed and discussed. Due to the limited number of relevant articles found in the initial scope of the study, no time limitations were imposed on the database searches. A combination of keywords and Boolean operators was used for the search: "Cardiovascular Disease (CVD)", "Patient Education", "Webpage", "Online Health Information", "Online Patient Educational Material", and "Internet". In this literature review, the eligibility criteria considered studies assessing readability, understanding, and quality of the content of webpages about internet-based information about CVD via Google published in English in the Kingdom of Saudi Arabia.

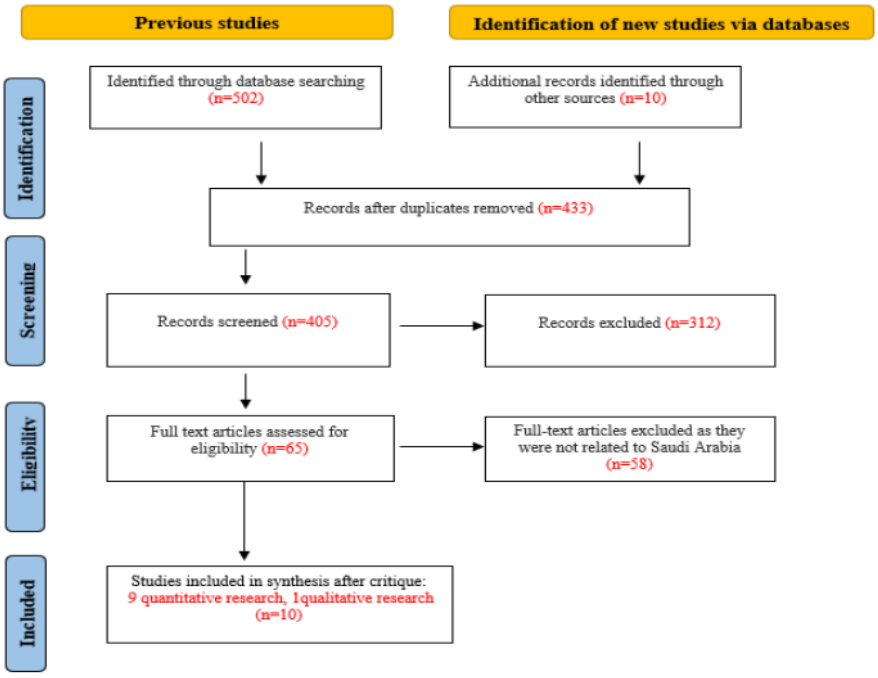


Figure 1: A flow chart of the literature search strategy and review process, according to PRISMA 2009 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) rules (Moher et al., 2009).

Figure 1 illustrates the process for selecting the eligible articles. The Critical Appraisal Skills Programme (CASP) checklist was adopted as an appropriate appraisal tool in this research.

2.2 Studies Selected and Study Appraisal

The electronic search yielded 502 studies concerning CVD from around the world. After screening each title, abstract, full article and eliminating duplicate publications, only ten met the selection criteria and were appraised. These were: Leung et al., (2020); Cajita et al., (2017); Oloidi et al., (2020); Ayyaswami et al., (2019); Tahir et al., (2020); Siddiqui et al., (2020); Arslan et al., (2019); Rodriguez et al., (2020); Kirthi & Modi, (2012); Kapoor et al., (2017). The ten selected studies

were assessed with respect to the accuracy, transparency, readability, navigability, understandability, and quality of the information and materials they provide regarding CVD.

2.3 Theoretical Critique

"Theory" means "to see" or "to be aware of", referring to the concept of theory as information that is seen or understood" (Rashwan, 2020). "A theory can be described as the collection of statements about a general behaviour or structure that hold consistently across an extensive range of specific circumstances" (Menge & Sutherland, 1976). "Research that considers theory increases its robustness, rigour, relevance, and significance" (Shah & Al-Bargi, 2013). "In qualitative and quantitative (and mixed) research processes, theoretical approaches can be applied at a variety of phases in different ways" (Shah & Al-Bargi, 2013).

"Medical information is increasingly sourced online. It is a development that has revolutionised patients' access to healthcare information. Previously, scientific information was mostly obtained through direct contact with reliable sources, most notably qualified professionals and/or official publications" (Leung et al., 2020). However, "as information online remains inadequately moderated, potentially harmful information can be easily spread" (Arsenault et al., 2016). Given this, "organisations have taken steps to issue guidelines regarding the production of high-quality health information. The UK National Health Services (NHS) has, for example, developed a toolkit to help in the creation of high-quality information for patients" (NHS, 2003). No theories have been used or mentioned in this research among the ten selected articles.

2.4 Overview of Methodological Critique

The ten included studies each seek to explore and understand online health information(OHI) on CVD provided through online platforms, along with the quality and usefulness of such websites in improving the health and wellbeing of patients with CVD. This meant they looked to understand

the accuracy, quality, and transparency of available OHI, the value of the message, and barriers to its use all over the world. They adopted various research methodologies to undertake this research, thereafter, the ten studies selected show an overall picture of the status of CVD health information and the challenges.

2.4.1 Quantitative and Qualitative Method Studies

"A quantitative method is an approach that can help detect patterns in the problem under investigation and quantify it, in this case, the quality and consumption of CVD -related health information online" (Saquib et al., 2017). Of the ten studies considered here, nine adopted a quantitative research method, with some augmented by adding a small-scale qualitative approach (namely, Riordain & Porter, 2020; Cajita et al., 2017; Oloidi et al., 2020; Ayyaswami et al., 2019; Tahir, 2020; Siddiqui et al., 2020; Arslan et al., 2019; Rodriguez et al., 2020; Kirthi & Modi, 2012; Kapoor et al., 2017).

2.5 Thematic Analysis

Five themes were identified in this research as follow: (1) Readability and Quality of Online Information Regarding Heart Disease (three studies of Leung et al., 2020; Tahir, 2020; Kirthi & Modi, 2012), (2) Readability Assessment of Online Patient Education Materials (four studies of Siddiqui et al., 2020; Arslan et al., 2019; Rodriguez et al., 2020; Kapoor et al., 2017), (3) Readability Analysis of Online Cardiovascular Disease (one study of Ayyaswami et al., 2019), (4) Readability, Understandability, and Actionability of the heart online failure information (one study of Cajita et al., 2017), and (5) The Quality and Readability of Internet-Based Health information (one study of Oloidi et al., 2020).

2.5.1 Readability and Quality of Online Information Regarding Heart Disease

The study of (Leung et al., 2020), "aimed to evaluate the readability and quality of webpages regarding Ischaemic heart disease (IHD) and dental treatment. However, healthcare information is increasingly being sought on the Internet. IHD or CVD poses a significant health burden. Overall, OHI related to IHD, and dental treatment is generally too difficult for the average individual to read, understand, or act upon, and may be of questionable quality".

"Health On the Net (HON) is a Swiss-based non-profit foundation founded in 1995. It is among the first attempts to create a platform to help patients and medical professionals access reliable healthcare information online. To be awarded a HON certification, a website must meet the eight principles outlined in the HON code of ethical conduct" (Leung et al., 2020). The eight principles include authorship, confidentiality, justifiability, advertising honesty, editorial policy, and complementarity. The other tenets included attribution and transparency of sponsorship and authorship (HON, 2020). "Current research, three searches were performed on the Google search engine. The (FRE) score and Simple Measure of Gobbledygook (SMOG) tools were employed to assess readability. Meanwhile, quality was assessed through the Patient Education Materials Assessment Tool (PEMAT) questionnaire, the Journal of American Medical Association (JAMA) benchmarks, along with the HON seal" (Leung et al., 2020).

"The data demonstrated the most examined webpages were commercial (83.3%). The (FRE) rating of the 66 web pages varied from 13.8 to 62.7. The mean total readability score (±SD) was 44.2 (±11.8). The readability of 90.1% of the web pages was deemed fairly to very difficult. The SMOG index of the 66 web pages varied from 7.5 to 14.3, with a mean total readability score (±SD) of 10.8 (±1.8). The PEMAT understandability scores distribution (±SD) for all 66 web pages was 55.9% (±17.5%), with a range between 16.7% and 90%. Just 16 achieved the minimum score of

≥70% in regard to understandability. The mean actionability score (±SD) of the 66 web pages was 37.4% (±28.3%). The range was from 0% to 100%. Both understandability and actionability scores generally fell below the general population's comprehension level. Lastly, just 12.1% of websites displayed the HON seal" (Leung et al., 2020).

"Moreover, Tahir et al. (2020) concluded that high blood pressure (BP) is an important contributing factor to CVD worldwide. Patients seek symptoms, preventions, treatment, and other medical conditions by looking for quality and easy-to-read OHIs. As a result, this paper aims to evaluate the quality and readability of OHI related to blood pressure and cardiovascular disease. A clear purpose, a concise source of information, and a high level of quality are the criteria for the highest-scoring sites. Even though high blood pressure is a very prevalent disease, most websites did not provide precise or accurate information regarding treatment options". "Tahir et al. (2020) note that the (FRE) score is a good method to test the readability of websites. The median FRE score of the websites studied was 58.5 (fairly difficult to read). The standard deviation (SD) was 11.1 and the mean Age Grade Level (AGL) 8.8, with SD 1.9. The overall readability score of the studied websites was 'fairly difficult to read. Information category websites, which had higher DISCERN scores in both assessments (FRE score and AGL), were found to have even worse readability results. These quality and readability assessments were undertaken on 15-30 September 2018. IBM the Statistical Package for the Social Sciences (SPSS) Statistics v-20 software was used for statistical analysis. To improve the reliability of the undertaken assessment, the links were individually evaluated by two groups, namely Health Professionals (HPs) and Lay Subjects (LS). Kappa was calculated before determining the average value for both groups. The average DISCERN value of HPs was 49.43 ± 14.0 (fair quality). For LS, by contrast, it was 48.7 ± 12.2. The mean (FRE) score was 58.5 ± 11.1, which means it fairly difficult to read. Moreover, the

(AGL) was 8.8 ± 1.9. No website scored above 73 (90%). In both groups, just 4 (16%) of the websites achieved a DISCERN score higher than 80%. Normality and homoscedasticity tests were done to assess the distribution of scores across both groups. This showed that information category websites achieved a high DISCERN score, though their readability was worse" (Tahir et al., 2020).

"The study by (Kirthi & Modi, 2012) shows that the quality of online information on coronary angioplasty is variable. An assessment of the quality of online information available on coronary angioplasty was conducted." "The top 50 results for the search term "coronary angioplasty" were collected from three large search engines (Google, Yahoo, and Bing). In addition to duplicating content and requiring registration or login, the list excludes videos and documents' direct links. LIDA was used to evaluate all sites. A validated method of evaluating accessibility, usability, and readability of websites. (FRE) the score was also used as an independent measure of readability. Based on the above criteria, the findings showed that 86 out of 150 weblinks were excluded. In addition to accessibility scores, 64 sites received a usability score of 40/54 (74%), a reliability score of 32/51 (62%), and an FRE score of 47.5. The LIDA scores showed significant variability and did not correlate with each other and search engine rankings. Only three websites met the LIDA gold standard of 90%, with many not communicating current information in a way that lay readers can understand" (Kirthi & Modi, 2012).

2.5.2 Readability Assessment of Online Patient Education Materials

Siddiqui et al. (2020) "conducted a study that reveals that the readability levels of patient education materials on atrial fibrillation (AF) and CVD from both the academic hospital's institutions (AHI) and general medical website(GMW) are well above the level recommended by National Institutes of Health (NIH) and American Medical Association(AMA), posing a risk to the patients' understanding of the materials. Overall, the high readability scores found across all websites and

the differences between the groups have been attributed to the various goals and target audiences of the material."

"Siddiqui et al. (2020) undertook a Google search for the term "atrial fibrillation" to gather health information from 20 academic health institutions (AHI) and 20 non-affiliated general medicine websites (GMW) that were found through this method. The content was evaluated for readability. These materials from AHI and GMW demonstrated the a high school junior (11.64 ± 0.789) and a college freshman (13.050 ± 0.845). GMW websites tended to display most of the stories are at a 6th-grade reading level or higher. The mean readability grade and age levels were calculated for all websites. The overall average reading grade level (RGL) within both categories was determined, compared, and analysed via the SPSS software".

"A more extensive study contacted by Arslan et al. (2019), to locate heart murmur (HM) and CVD-related online information a Google search was again employed in 2019. Turbulent blood flow causes drones, which are abnormal sounds produced by the heart. Family members may be anxious when they hear drones coming from their children. It has analysed online materials related to (HM) and CVD for specific qualities such as readability, understanding ability, and popularity.

Overall, the study demonstrated that web pages describing (HM) relate to CVD were understandable and of high quality. Online sources' written materials should be more readable". "230 website results were then assessed in respect quality, readability, popularity, and understandability. The PEMAT measure for printed content was employed. This includes 17 items that help assess content understandability. Data were then entered via Microsoft Office Excel, with the PEMAT Auto-Scoring Form deployed to determine understandability values as percentages. Higher scores, in turn, signified more ease of understanding". In this study, "readability levels were measured through three tests: the (FKG) level, Gunning Frequency of Gobbledygook (FOG),

and (SMOG) as detailed below. The data was then analysed via SPSS. Patient educational content on 39% (n = 86) met the study's inclusion criteria. Data distribution normality was assessed through the Shapiro–Wilk test. The mean understandability value of all online patient educational materials (OPEMs) combined was 74.6% (SD=12.8%; range, 31.2-93.7%). The median understandability value was 80% (interquartile range, 70–83%). For (OEMs) from clinical practices and hospitals, it was 75% (interquartile range, 67–83%), while for materials from various health information websites, it was 75% (interquartile range, 65–85%). The intelligibility value of all three groups was over 70%. The overall mean readability scores of the selected websites, per the readability formulas, were significantly above a sixth-grade level" (Arslan et al., 2019).

(Arslan et al., 2019), "In total, 10.4 ± 1.65-grade levels were assigned to web pages (ranging from 7.5 to 14.1). FRE scores ranged from 32.4 to 72.9 (average 55± 9.1). This signifies a "fairly difficult" writing level. Based on the FKG Level Score, the average was 10 ± 1.81 (range from 6.8 to 14.5), and the average Gunning (FOG) and (SMOG) scores were, respectively. From 8.9 to 16.4 in range, 12.1 ± 1.85, and 9.1 ± 1.38 (range 6.7 to 12.2). No major difference in the readability values of the subcategories was found. Readability was measured, and all three indices were used. These produced scores with significant differences between the reading levels recommended for sixth grade and the actual reading levels." The average global quality score was 4.34 (SD = 0.71; range from 3 to 5), indicating the quality and information flow. A good deal of relevant information was available on most websites, although not all. Just 14 (16.3%) websites had HON certification. However, overall, it was determined that websites that provided information on (HM) were understandable" (Arslan et al., 2019).

"Rodriguez et al. (2020) conducted a study to identify that coronary artery calcium (CAC) in the prevention of cardiovascular disease. Information from scans can help reclassify risk and guide

treatment decisions made by the patient and the physician together. In addition, CAC has been shown to improve predictive capability beyond traditional risk factors in atherosclerotic cardiovascular disease (ASCVD). The use of (OPEMs) increases among patients when making medical decisions. It may also result in misunderstandings among patients, which could exacerbate disparities in cardiovascular health among those with lower health literacy".

"An online search engine was also employed by Rodriguez et al. (2020) to identify the 50 most accessed websites, per the search results as of 17 December 2019. The (RGL) was assessed through the observations nestled within the readability metrics of each selected website using generalised estimating equations. All search terms had an RGL of 10.9 (95% CI, 9.3-12.5). Among the search terms, the grade-level readability of OPEMs was 9.5 (95% CI, 5.6–11.5)".

(OPEMs) are generally readable at grade level for the search terms "coronary artery calcium scan," "heart scan," and "CAC score", respectively. There were 10.7 (95% CI, 9.0-12.5), 10.5, and 11.9 (95% CI, 10.3-13.5). There were a greater number of scheduling tools frequently for the search term "heart scan" as compared to (n=28, 56%) "CAC scan" (n=18, 43.9%) and "CAC score" in which the sample size is 10 (29. 4%). The highest average reading level was found for professional society and news/media/blog websites (12.6). In contrast, health system websites demonstrated the lowest average reading level value (10.0). Fewer than half of the sites included images or videos explaining their content (45.3%). All data was collected from public websites'' (Rodriguez et al., 2020). Current OPEMs on CAC scans showed that the reading level of the general population is higher than recommended, which could cause patient misunderstandings that could exacerbate cardiovascular disparities for those with more limited literacy in health. The grade-level readability of OPEMs concerning CAC significantly achieved a reading level above 6th by the AMA. High readability values disproportionately affect patients suffering from a lack of health literacy, as 70%

of people are estimated to make health decisions based on information that is located on the internet" (Rodriguez et al., 2020).

"The study by (Kapoor et al., 2017) purpose study is to determine if the online patient education material provided by the American College of Cardiology (ACC) and the American Heart Association (AHA) is written at a level higher than the 6th–7th-grade level recommended by the (NIH)".

"A total of 372 articles from the ACC website and 82 articles from the AHA were examined. An RGL analysis was conducted on each online patient education website using Readability Studio Professional Edition. NIH-recommended 6.5 grade level and 8th grade national mean was compared with the mean RGLs obtained from 8 formulas using one-sample t-tests. Compared with NIH's recommended grade level of 6.5 and the national average of 8, all analysed articles had significantly higher RGLs ($p < 0.00625$). ACC and AHA patient education materials are written above NIH's recommended 6.5-grade reading level, and 8th grade national mean reading level" (Kapoor et al., 2017).

2.5.3 Readability Analysis of Online Cardiovascular Disease

"Ayyaswami et al. (2019) conducted a study to examine the readability of the most frequently Googled online health-related education materials for (CVD). Online cardiovascular health materials are easily accessible with an Internet connection, but the readability of its content may limit practical use by patients".

"Ayyaswami et al. (2019) examined the most readability frequently Googled online education materials related to health for (CVD), by 20 key searches. These terms are aneurysms, angina, atherosclerosis, cardiomyopathy, congenital heart disease (CHD), coronary artery disease (CAD),

deep vein thrombosis, exertional dyspnoea, High blood pressure, heart attack, heart failure, lower extremity oedema, mini-stroke, pulmonary embolism, pericardial disease, heart diseases, strokes, rheumatic heart disease, sudden death, and peripheral arterial disease. The results of 15 Google searches, which had 10 results per page, were reviewed. This produced 196 relevant online sources for quantitative analysis. Readability was assessed per 10 different measures to limit bias from commercially available software. Any individual scale can be deployed to conduct the assessment (namely, Readability Studio). The readability measures employed included the (FRE), Coleman-Liau Index (CLI), (FKG) level, Gunning Fog Index (GFI), FORCAST Readability Formula, New Dale-Chall formula (NDC), New Fog Count (NFC), (SMOG) Index, Fry Readability Formula (FRF), and Raygor Readability Estimate (RRE). The data presented shows the 196 articles had an average 10.9 (SD = 1.8) (RGL). The articles were about 99.5% of the 5th- to 6th-grade level the AMA recommends. The FRE test indicated the readability of the chosen articles to be "fairly difficult" (M = 52.3, SD = 12.1 of 100)" (Ayyaswami et al., 2019).

2.5.4 Readability, Understandability, and Actionability of the heart online failure information

"Cajita et al. (2017) conducted a study to evaluate the quality and health literacy demand (readability, understandability, and actionability) of the heart failure (HF) information found online. Overall, the (HF) information found online was of fair quality but required a relatively high health literacy level to understand it" (Cajita et al., 2017). "Cajita et al. (2017) assessed the quality, readability, understandability, and actionability of online heart failure content. Google, Yahoo, Bing, Ask.com, and DuckDuckGo were used to search for relevant websites. The (HF) information's quality was assessed through the DISCERN instrument. Readability was determined via seven different tests. Understandability and actionability were evaluated through PEMAT. A

Shapiro-Wilk test was used to determine whether the mean quality ratings, readability levels, understandability scores, and actionability scores were normally distributed. One-way Analysis of Variance (ANOVA) with Bonferroni correction helped compare mean quality ratings and mean understandability scores of the three types of websites. The different types of websites are (government-sponsored vs hospital-affiliated vs other)".

"A Kruskal-Wallis test was deployed to compare the mean readability levels and mean actionability scores of the three types of websites. Statistical analyses were conducted via Stata13 software" (Cajita et al., 2017). The "Overall mean quality was 46.0 ± 8.9. The mean readability score was a 12.6-grade reading level. The overall mean understandability score was 56.3% ± 16.2. Significant variation was apparent in the mean scores across the PEMAT-Understandability items. The mean actionability score was 34.7% ± 28.7. The mean scores across the PEMAT-Actionability items also differed. Of the 46 websites, 24% were rated as poor quality, 46% as fair quality, and 30% as good quality. The websites' readability scores ranged from a 9th-grade level to greater than an 18th grade (i.e. graduate school) reading level. The overall mean readability score was a 12.6 ± 2.7 grade reading level. Most websites did not adopt visual aids to help users follow instructions" (Cajita et al., 2017).

2.5.5 The Quality and Readability of Internet-Based Health information

"The study by Oloidi et al. (2020) aimed to assess the quality and readability of internet-based information related selected Angiotensin Receptor Blockers (ARBs) websites and health information of CVD. Overall, patient information on the reviewed ARB's websites was of moderate quality and suboptimal readability. Content providers on websites should ensure that health information is of favourable quality and easy to read by patients with varying degree of health literacy." (Oloidi et al., 2020). "The qualitative study by Oloidi et al. (2020) used three

search engines (Google, Yahoo and Bing) to identify relevant (ARBs) websites. The quality of the identified websites was assessed via the DISCERN instrument while readability was evaluated using the SMOG instrument and the Flesch-Kincaid readability (FKR) algorithm. Final ratings were then calculated per the guidelines of the instrument developers. The readability scores were calculated using Microsoft Office Word. Only 24 websites remained for evaluation. Inter-class reliability for losartan and valsartan was calculated as 0.804 and 0.695, respectively. Thus, the average overall DISCERN score was 2.99 (SD±1.05). No website had an excellent rating. 15% were rated good, 66% moderate, and 19% poor. The inter-class reliability was 0.804 for losartan and 0.695 for valsartan. The mean FRE score for the websites was 48.87 (SD±16.12), mean (FKR) Grade Level was 9.29 (SD±1.98), and the mean SMOG value was 11.29 (SD±1.70). The information found on the selected (ARBs) websites was of moderate quality and suboptimal readability" (Oloidi et al., 2020).

2.6 CVD Online Information in Kingdom of Saudi Arabia

"CVD patients in the Kingdom of Saudi Arabia increasingly search for information about their condition online. A significant percentage of CVD patients (46.6%) said they began using medications advertised on various social media platforms without consulting a registered physician. Moreover, 42.6% of patients stopped taking their medication after reading negative messages on social media. The problems cited were insufficient time with healthcare providers and a lack of sensitivity to Arabic patients' specific needs. Others were mistrust of healthcare providers and/or systems, coupled with an absence of trust in the available diagnosis and treatment options" (Iftikhar & Abaalkhail, 2017). The following subthemes will discuss the CVD online information in the Kingdom of Saudi Arabia in terms of its availability, usage, challenges, and online health messages for patients.

2.6.1 Availability of Online Information about CVD

"Health information is for CVD patients critical in the effective management of not only their condition but also their general wellbeing. While more patients wish to use online CVD-related health information, few use these platforms in the Kingdom of Saudi Arabia compared with nations in Europe and North America. CVD-related health information serves different functions for different patients" (Marar et al., 2019). "The availability of online information related to CVD in the Kingdom of Saudi Arabia is challenging because of an inadequate structure, which does not inspire sufficient trust in its use" (Alshehri et al., 2021). "Data shows that 76.1% of patients used social media platforms to access information on their health condition. Similarly, 92.6% of participants used the internet to access information on their health and/or their family members. This included information concerned CVD risks, prevention, and management. Participants' most preferred social media platforms were WhatsApp®, YouTube® and Twitter® (91.5%, 84.6, and 82.6%), with the Saudi Ministry of Health (MOH) being the most used health information related website (67%)" (AlMuammar et al., 2021)

"People in the Kingdom of Saudi Arabia encounter certain barriers to perceived benefits such as privacy, legal framework, data standards and HPs. This results in limited dissemination of health information in the Kingdom of Saudi Arabia, which is caused by over-complicated systems, a shortage of trained medical personnel, inadequate information, and the absence of proper data standards. Such constraints mean these platforms are of little to no help for CVD patients" (Gutierrez et al., 2018). "The Saudi population's social, cultural, and economic diversity is another barrier to CVD access, treatment, and management. Saudi residents have poor awareness of the possible benefits of accessing CVD-related information. Furthermore, the health system is underfunded, legal frameworks are inadequate, and a shortage of proficient health personnel.

Public awareness can help to reduce CVD prevalence. Data standards are also poor in the Kingdom of Saudi Arabia, which presents significant difficulties in respect dissemination of CVD-related health information to target populations'' (Gutierrez et al., 2018).

2.6.2 Use of the Internet to Disseminate CVD Information

"Online platforms have become trusted and widely utilised channels for communication between hospitals and patients in the Saudi healthcare setting'' (Marar et al., 2019). "Most Saudi youths consider the internet to be a good source of information regarding learning how to improve their health. The Saudi Arabian government should aim to develop strategies that enhance the amount and quality of online CVD-related health information" (Marar et al., 2019). "Indeed, many Saudi Arabian hospitals have already launched websites to share CVD-related health information with the public" (Almansour et al., 2020). "Alshehri et al. (2021) notes that more than half (59%) of the websites in the Arab world that provide news and developments regarding CVD are commercial. Roughly 30% of people reported that online information had impacted their decision-making regarding visiting a registered physician. A mere 6.7% of all websites included for assessment were granted the HON code seal". "Privacy and limited trust in online healthcare services are important parameters that need to be improved to enhance e-health readiness in the Kingdom of Saudi Arabia" (Al-Anezi, 2021).

2.6.3 The Challenges in Technological Acceptance of Online Information on CVD

"The content and accessibility of websites are the largest barriers to accessing CVD information online in the Kingdom of Saudi Arabia. Just 41% of the 225 assessed websites were medical, as others were commercial and did not prioritise health information regarding CVD" (Alshehri et al., 2021). "Most websites in the Kingdom of Saudi Arabia also have poor transparency. This poses a major challenge, as it reduces the utility of CVD-related OHI. Many Saudi websites fail to attribute

their authors, even though this is essential for patients to determine their professional credibility" (Marar et al., 2019). "In evaluating the readiness of Saudi Arabian patients in the adoption of an e-health system via their mobile phones, most surveyed patients were found to suffer from CVD and diabetes. Almost all the participants (99.0%) owned a personal mobile phone and could use it to access the internet. Most participants did not fully trust or believe in online health services and/or online medical consultations. Therefore, they did not spend any money on health services provided through mobile phones. Such poor motivation in the adoption of e-health systems may be due to fear of privacy violations, the possible loss of personal data and information, insufficient technical support, and mistrust of doctors who frequently use their mobile devices to distract themselves while at work (or at least that is the perception of some)". Saudi Arabia's population is hesitant to embrace the 2030' Saudi Arabia vision and strategic plans that emphasise to promote the use of e-health systems. Creating awareness campaigns and strategies that promote e-health adoption benefits in the Saudi Arabian health system is important. Crucially, network administrators must implement procedures that can maintain patient confidentiality and security" (Al-Anezi, 2021).

2.6.4 Online Health Messages for Saudi Arabia's Patients

"Aldabbagh et al. (2013) examined the quality of OHI for Saudi patients based on an analysis of 122 websites from around the Arab world. The results showed that a sudden increase in the amount of health information available to patients resulted from the rise of Arabic websites containing health-related information. However, the websites made only a limited contribution to medical and health services and/or advice. If they made any contribution at all, they failed to meet the standards outlined in the HON code". "On the other hand, Al-Muammar et al. (2021) found that the Saudi MOH website was the best online provider of CVD-related health information in the Kingdom of

Saudi Arabia". "Some significant differences between men and women were noted in respect their health education needs, barriers, and preferences" (Al-Khashan et al., 2012).

2.7 Summary

This chapter aimed to provide a deep insight into existing research that has examined the accuracy, transparency, readability, and navigability of CVD -related OHI on English-language websites in the Kingdom of Saudi Arabia. This research has conducted a quantitative approach. Four dominant themes emerged. However, there is a gap in the existing literature on the Kingdom of Saudi Arabia regarding evaluating the accuracy, transparency, readability, and navigability of the CVD -related OHI, which necessitates further research in this field. To fill this gap, the current study aims to evaluate the CVD online health information in the Kingdom of Saudi Arabia in terms of its accuracy, transparency, readability, and navigability. The research methodology used to this end is discussed in chapter 3.

CHAPTER 3 METHODOLOGY

3.0 Introduction

The following chapter documents different stages of the research process, from data collection to analysis. This chapter highlights the research objectives and aims and details the research progression and development. The significance of quantitative evidence to assess the quality of websites is paramount, which is why a critical stage in the research methodology was selecting the appropriate tools. In this context, a framework developed by England and Nicholls (2004), which employs a quantitative descriptive method to assess the quality of websites concerned with cardiovascular disease (CVD), was adopted due to the advantage of including a screening tool for websites evaluation. All decisions made in the chapter are based on the research aims and objectives. The information contained in the chapter has implications for the quality assessment of

websites with details related to CVD. The path to the findings will help improve the quality of websites for consumer access to public health among Saudi internet users.

3.1 Research aim and objectives

The following aims and objectives were formulated to guide this study.

3.1.1 Aim

- To quantitatively evaluate the accuracy, transparency, readability, and navigability of the internet-based information and materials about CVD websites in the Kingdom of Saudi Arabia. A Web Content Analysis of Saudi Arabia's Health Education Websites focusing on health promotion and physical activity.
- The study intends to help improve patients' access to public health for Saudi internet users attempting to access CVD information. It develops insights about the standard of the information regarding accuracy, transparency, readability, and navigability. The evaluation is based on a screening tool developed by England and Nicholls (2004).
- To help improve health self-care following to the Kingdom's Vision 2030 strategic development plan that aims to ensure that all patients can lead a healthy lifestyle and be aware of their health self-care with regards to CVD.
- To assess the level of awareness of health promotion initiatives regarding preventative or health self-care services. The above aims will be achieved through the following objectives:

3.1.2. Objectives

- To assess the accuracy of Saudi Arabia's websites' regarding CVD.

- To assess the transparency of Saudi Arabian CVD websites by analysing the authorship, attribution, currency, disclosure, complementarity, and kitemarks as suggested by HON (2020).
- To assess the readability of Saudi Arabian CVD websites' by employing Microsoft Office Word (2016) to test (FRE) and (FKG) levels as suggested by Linney (2017).
- To assess Saudi Arabian CVD websites' navigability using the external links provided by these websites, as suggested by (Wojdynski & Kalyanaraman, 2015) and (Sandvik, 1999).

3.2 Theoretical Perspective and Research Design

In terms of the study's theoretical perspective and research, the Health Belief Model (HBM) and Mass Media and Health Promotion theory were used as a theoretical framework, within which the study is situated. The HBM was initiated by Rosenstock (1988), and later adopted by other researchers. The purpose of this model was to comprehend individuals' perceptions of health (De Bock & Spura, 2021).

The media has an important influence on public health awareness and attitudes. Information provided via media channels can enhance individual and collective knowledge change behaviours and, lifestyles and social norms, w, in turn, result in positive public health outcomes (Gashu et al., 2021).

The current research identifies two distinct paradigms (Kalu, 2017; Levitt et al., 2018; Grønmo, 2019; Kivunja & Kuyini, 2017). The HBM indicates that a paradigm refers to the researcher's interpretation of the world's view. This approach denounces the purpose of the research, the research objective, and the methodological approaches taken. Levitt et al. (2018) specify the two paradigms as the interpretivist paradigm and positivist paradigm.

3.3 Location and Access

The data gathered in this study was web-based, which was the location of the study, and was conducted through copious internet searches. It took approximately six days to collect the data from the web searches, commencing from 5 November 2021 to 10 November 2021. Ethical approval to access the data for this study was not required because it was already available in the public domain. Moreover, it should be noted that the researcher's PC was always password encrypted. In total, 40 websites were selected concerning CVD, where initial screening confirmed that all data to be gathered for the research was readily accessible in the public domain. The overall time for gathering data was adequate, as it took 40 minutes to complete the questionnaire.

3.4 Sampling Strategy

The sample comprises a selection of several individuals or subsets from a larger population (Majid & Vanstone, 2018). Careful consideration was required so that this sample focused on persons located in the Kingdom of Saudi Arabia, who frequently access online information regarding CVD. The study used a convenience sampling strategy, defined as a non-probability technique that collects market research data from a fittingly available pool (Jager et al. 2018). The method is popular due to its promptness, simplicity, and scale of economics. In the process, each aspect of the population has a known non-zero probability of being chosen rand selection steps (Jager et al. 2018), in this case, websites. Besides, websites were selected by the perceived impact they have on the sample patients.

3.4.1 Inclusion and Exclusion Criteria were as follows:

3.4.1.1 Inclusion Criteria

- Websites written in the English language also provided an option to translate the content into Arabic.

- Websites listed on the first three pages of Google, Yahoo, and Bing search engines.
- Websites that were published in the Kingdom of Saudi Arabia.
- Websites that offer CVD information.

3.4.1.2 Exclusion Criteria

- Websites with a paywall.
- Websites with PDF documents.
- Websites that were not based in the Kingdom of Saudi Arabia.
- Websites that were not written in English.

Based on the above criteria, websites that did not target Saudis, did not present information regarding CVD, and/or were written in a foreign language, were excluded. The study targeted those websites that Saudi residents frequently access. Extensive suggested a total of 40 websites sample for inclusion in the study. The website samples comprise four main categories: 4 websites were commercial; 21 were provided by charities, health professionals or private sponsors websites; 14 were government-provided; 1 fell under the other category, see figure 2.

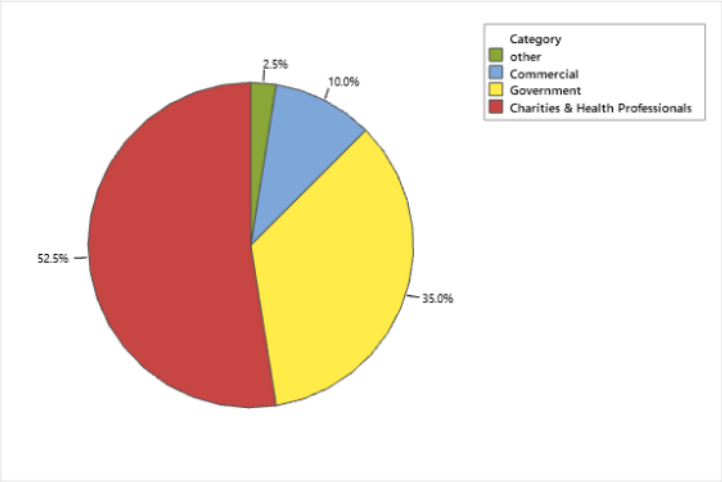


Figure 2: Chart of Website Categories

The researcher was confident that a sample of 40 websites, all of which fulfilled the inclusion criteria and were visited by Saudi patients to access CVD information, was adequate to meet the study's aims and objectives. To identify the pool of potential websites for including in the sample set, specific search included CVD', 'CVD in Kingdom of Saudi Arabia', 'information on CVD for patients in Kingdom of Saudi Arabia', and 'public health sample set, specific search terms were used that included CVD', 'CVD in Kingdom of Saudi Arabia', 'information on CVD for patients in Kingdom of Saudi Arabia', and 'public health and cardiovascular disease'. After identification of the potential website pool, the selection was determined by the statistical presentation and whether they had important information about CVD diagnosis, prevention, symptoms, and treatment options.

3.5 Methods of Data Collection

This study employed a screening tool as a questionnaire to collect data later analysed and presented quantitatively. The adoption of this approach was influenced by England and Nicholls (2004), who employed it to assess the accuracy and transparency of information on cardiovascular disease websites. The authors granted permission to use this tool on 25 October 2021, see appendix A. In the present study, the screening tool was utilised to determine accuracy and transparency by referencing several factors regarding the quality of CVD-related medical health information. The study also employed a technique highlighted in Sandvik (1999) to evaluate navigability. The selection of specific techniques was determined by considering that the data analysis's efficiency depends on the data collection tool employed. A copy of the adapted tool is presented in appendix B.

3.5.1 Characteristics: Categorisation and identification of each website was undertaken by reference to top-level domain (TLD), country of origin, and website source, as well as if the site required registration, had an online discussion platform or was linked to other social media.

3.5.2 Accuracy: Eight questions, with a total possible score of 22, were used to measure the accuracy of medical information related to CVD on each selected website. The eight questions' focused on the definition, aetiology, prevalence, risk factors, symptoms, diagnosis, treatment and prevention via early identification and complications. Regarding each question, a score of 2 denoted complete information; a score of 1 meant some information was available, while a score of 0 indicated no CVD information was available. Questions regarding medical information were formulated per the latest evidence from the National Institute for Health and Care Excellence (NICE) (2020), NHS guidelines articles (Guidelines, 2020) and other reputable CVD information sources.

3.5.3 Transparency: Transparency standards were employed to categorise credible websites, which were checked by reference to the Health Code of the Net Base (HON, 2020). The HON code principles were employed to develop 24 questions, with a maximum score of 38. The principles of the HON Code are detailed further below.

The principles of the HON Code details include (1) Authorship: Authorship focuses on the analysis of the website author and their credentials (Chang et al., 2019) ;(2) Attribution: Attribution relates to whether the sources for information used on the website are credible and the credentials of those who produced the sources, which should be highlighted on the website (Chang, Grubbs, & Ingledew, 2019). ;(3) Currency: Currency focused on when the information was created and how often it is updated so that an assessment can be undertaken as to whether it is correct and up to date (HON, 2020).; (4) Disclosure: Where a website receives funding from is important to

disclose, the website's ownership should be detailed, and any relevant advertising, underwriting, sponsorship, and/or commercial funding arrangements. Any possible conflicts of interest should be fully and disclosed (HON, 2020).; (5) Kitemarks: kitemarks were developed to evaluate the quality, value, and credibility of the website content (Sbaffi & Rowley, 2017).; (6) Complementary: HON (2020) stipulates that websites that providing health-related information need to explicitly state that the information they provide to users is not health advice. There also needs to be a short statement that outlines the website's mission and purpose.

3.5.4 Readability:

Readability how easy it is for a reader to understand the website's textual content (Kher et al., 2017). Microsoft Office Word, (2016) FRE function provides a specific test score between 1 and 100. This indicates the educational level a reader requires to understand a given text. Daraz et al. (2018) note readers require a reasonably high academic level to understand the content on most health websites. Low readability can negatively affect understanding of the information provided (Diviani et al., 2015).

3.5.5 Navigability:

Navigability evaluates the ease with which users can access information by clicking on website links (Sandvik, 1999). For this study, the search engine of choice was Google due to its popularity to classify the 40 selected websites. It also delivers local information before displaying international results (Price, 2020), see figure 3.

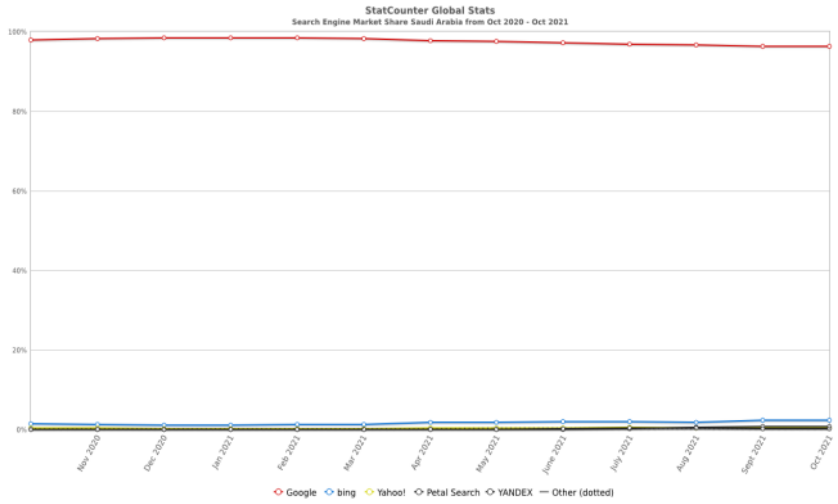


Figure 3: Statcounter Global Stats - Search Engine Market Share in Kingdom of Saudi Arabia, 2021

3.6 Data Handling and Analysis

Microsoft Excel (2016) and (SPSS) were employed to input data for statistical analysis (Li et al., 2020). The data from the 40 selected websites were interpreted via tables, charts, and descriptive statistics. The findings were then organised to delineate the nominal data and percentage frequency (Higgins et al., 2019). The data collection process took place from 11 November to 16 November 2021, see appendix C.

3.6.1 Accuracy:

Eight questions with a total score of 22 were utilised to assess the accuracy of the medical data. The eight questions' focused on the definition, treatment and prevention, aetiology, complications, risk factors, early identification, diagnosis, prevalence, and symptoms. Regarding each question, 2 scores denoted complete information; a score of 1 meant some information was available, while a score of 0 indicated no CVD information was available.

3.6.2 Transparency:

Transparency was measured through nineteen questions. The maximum scores for the questions varied between 1 and 2. A website that offered full transparency could have a top score of 38 for all items. The measured items included authorship, complementarity, attribution, disclosure, currency and kitemarks. The breakdown of these items is as below:

Authorship (five questions, maximum score of 9).

Attribution (four questions, maximum score of 7).

Currency (three questions, maximum score of 4).

Disclosure (six questions, maximum score of 7).

Complementarity (one question, maximum score of 1).

Kitemarks (five questions, maximum score of 5).

The web addresses were also entered on the official HON search page to determine if the HON code approved them. By installing the HON code toolbar in the primary search engine, websites can be automatically filtered and easily identified as HON-code certified, see appendix E.

3.6.3 Readability:

Website readability was assessed through the FRE and FKG. Microsoft Office Word has a built-in readability tool. This tool analyses a selected text and then provides a numerical value, which helps determine the grade level a reader needs to understand the content of the said text. The FKG level or overall grade level were employed to identify the Average Grade Level. The web page's content was copied and pasted into Microsoft Word to determine the readability level. Every

website was then assessed to ensure only relevant information was analysed. For each examined website, the numeric values of FRE and AGL were determined, as shown in equation 1 below:

$$FRES = 206.835 - 1.015 \times \left(\frac{words}{sentences}\right) - 84.6 \times \left(\frac{syllables}{words}\right).$$

Equation 1: (Source: Tahir et al., 2020).

FRE values range between 0 and 100, with readability easier as the number increases (Protheroe et al., 2015). The AGL was determined using equation 2 below:

$$AGL = 0.39 \times \left(\frac{words}{sentences}\right) + 11.8 \times \left(\frac{syllables}{words}\right) - 15.59.$$

Equation 2: (Source: Tahir et al., 2020).

FRE was measured by comparing the lengths of the sentences in a text with the appropriate length that is easy to read. FRE and AGL outcomes are inversely correlated, in which case a context with a low AGL score must have a high FRE score (Tahir et al., 2020). In the Kingdom of Saudi Arabia, patients attempting to get information about CVD are generally non-English speakers. This makes it even more important that such information is not difficult to comprehend. It is essential to realise that the recommended reading level applies to English-speaking individuals. Therefore, using these recommended levels to Non-English speakers should be a potential limitation.

3.6.4 Navigability:

Navigability relates to the ease of mobility of online content. That is, how easy it is to locate information, how contextual the location is, and the user's process to find it (Williams et al., 2019). The process begins with the website home page. An attempt was then made to navigate the drop-

down menus and/or click the related links on the page to locate transfer information. The scoring index has two points using the Sandvik test (1999). These are as follows:

2 points – data was effectively discovered by following links from the homepage.

1 point – data was found with difficulty.

0 points – contents were scattered about with no search engine provision.

3.7 Validity and Reliability

Mythological validity relates to honesty based on the results in a study and is commonly prominent by measuring the validity of a study (Grønmo, 2019). In this study, validity was confirmed through the adaptation of England and Nicholls' (2004) data collection tool, see appendix B. However, an important point made by Kivunja and Kuyini (2017) highlights that where a test of a study has proven to be reliable, the study does not necessarily mean that it is also valid. Conversely, a test that has shown that the research project is unreliable will certainly also show that it lacks validity (Kivunja & Kuyini, 2017).

Inferential analysis using Fisher's Exact and Cronbach's alpha test within SPSS made it possible to measure the validity and reliability of the tests. Fisher's Exact Test (a tool that could measure whether the proportions of categories in two associated group variables differ considerably (Kim, 2017). Further, this gave a value of 69.100, $p = 0.002$. As (p-value p) is below the significance level ($\alpha = 0.05$), the relationship between the two variables is statistically significant website source and the accuracy of the provided information, see table 1.

Chi-Square Tests

Chi-Square Tests				
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	71.145	40	.002	.062
Likelihood Ratio	43.616	40	.320	.002
Fisher's Exact Test	69.100			.002
N of Valid Cases	40			

Table 1: Fisher's Exact Test

Cronbach's Alpha is used to measure the reliability (internal consistency). The evidence of reliability is a prerequisite to ensure that the test is of good integrity and quality, and conclusions drawn can be applied to the population. IBM SPSS v 27 was utilised to identify the reliability of tests adopted to measure the quality of websites. Cronbach alpha's greater than 0.6 are assumed reliable and acceptable. However, values less than 0.6 are pretty low and may be unacceptable. Therefore, Cronbach's alpha between 0.6 and 0.8 are moderate but acceptable, while values ranging from 0.8 to 1.0 are very good. Cronbach's Alpha for the overall questionnaire construct (except first three questions) was calculated to be 0.827, which suggested that the test measure is highly reliable, see table 2.

Reliability Statistics	
Cronbach's Alpha	N of Items
.827	.32

Table 2: Reliability Statistics of Overall Test

Besides, table 3 reveals the values of Cronbach's Alpha when a particular question is deleted from our survey construct. This shows that when any question is deleted, the overall value of Cronbach's Alpha remains in an excellent range, i.e., above 0.799≈0.8. Therefore, given the importance of Cronbach's Alpha, none of the questions is required to be deleted from the test, see appendix G. Similarly, Cronbach Alpha was calculated for each segment of the examination i.e., accuracy and transparency. Results from SPSS revealed Cronbach Alpha values of 0.986 and 0.699 for Accuracy and Transparency, respectively, suggesting high reliability of our tests.

	Reliability Statistics	
	Cronbach's Alpha	N of Items
Accuracy	.986	8
Transparency	.699	24

Table 3: Reliability Statistics of Accuracy and Transparency

3.8 Ethical Considerations

Since this study analyses websites in the public domain and available with open access on the internet, it was not essential to seek ethical approval from the Chair of the Universities research ethics committee or the search engine administration. It was unnecessary to gain approval for accessing the website since there are no gatekeepers. A formal informed consent (either written or verbal) was not required as the study did not involve human subjects (Nilsen, 2020). The websites used in the current study will be used by their webpage name in the latter parts of this research work in the Kingdom of Saudi Arabia.

3.9 Pilot Study

A pilot study was undertaken to assess the feasibility of the research and determine h whether any changes were necessary to carry out the study design. Each aspect of the pilot was evaluated to determine what strengths and weaknesses (Malmqvist et al., 2019). The pilot study was undertaken on 18 November 2021 to establish reliability. A student from Swansea University in the Faculty of Medicine, Health & Life Sciences conducted the pilot study. The student was provided with the data collection scoring tool and then randomly selected two websites from the list of Saudi Arabian websites, which were presented in numerical order. They reviewed their findings by completing the questionnaires. The researcher received the results and analysed them against the same websites. Similar results were found for both websites with no errors.

3.10 Summary

This chapter sheds light on the journey of gathering data based on the research aim. This chapter describes the research paradigm as a post-positive paradigm concerned with gathering statistics. Considering the goal and objective of the research, the design decisions have been made. The sampling procedure is also explained in detail. Additionally, the chapter confirms that no ethical or access issues are raised due to the study's nature, which utilised public domain websites related to CVD. The chapter distinguishes between the validity and reliability of a study and how they are measured. Discussions such as these are critical with justifications for decisions. Further, the pilot study is then examined. The findings will be analysed and discussed in the following chapter 4.

Chapter 4 Findings

4.0 Introduction

The current study examines to what extent online health information provided on Saudi Arabian websites regarding cardiovascular disease (CVD) is accurate, transparent, readable and easy to

navigate; three qualities that improve health promotion/education by providing patients with a valuable source of quality information. This chapter presents the analysis to determine accuracy, transparency, readability, and navigability of 40 sampled websites, see appendix C. while considering their characteristics, sources, audiences, and purpose.

A screening tool adapted from England and Nicholls (2004) was used for data collection. Questionnaire statements were distributed on a set of significant topics in classifying written questions related to CVD in the Kingdom of Saudi Arabia for evaluating sample websites. The collected data were statistically analysed using Microsoft Excel-2016 and the SPSSv27. Data from each selected website was analysed concerning pre-established criteria on the accuracy of the medical contents and transparency of the website about authorship, attribution, currency, disclosure, and Kitemark usage. The websites' readability levels were determined by applying the FRE score and FKG level score using Microsoft Word in-built feature.

Navigability was assessed to determine how easily CVD-related health information could be accessed by clicking on links provided on the websites' homepages. The study presents detailed descriptive and inferential statistical findings by assessing the accuracy, transparency, readability, and navigability of the selected websites.

4.1 Characteristics of the Website Sample

Information on website characteristics is essential as it can help determine any relevant correlations regng the study's goals. The first three key questions addressed the top-level domains (TLD), country of origin, and the administrators/source of the website. In addition, the screening tool contained four questions aimed at identifying whether the website required additional registration assistance and included discussion platforms and social media.

4.1.1 Website Domain

Analysis was undertaken to identify the different top-level domain names under which the selected websites were registered. The data shows that .com domain websites were the most frequent (n=12), amounting to 30% of the total sample, closely followed by the websites with a. med domain (n=11), amounting to 27.5%. The remainder of the website domains appeared significantly less frequently, ranging between one and five.

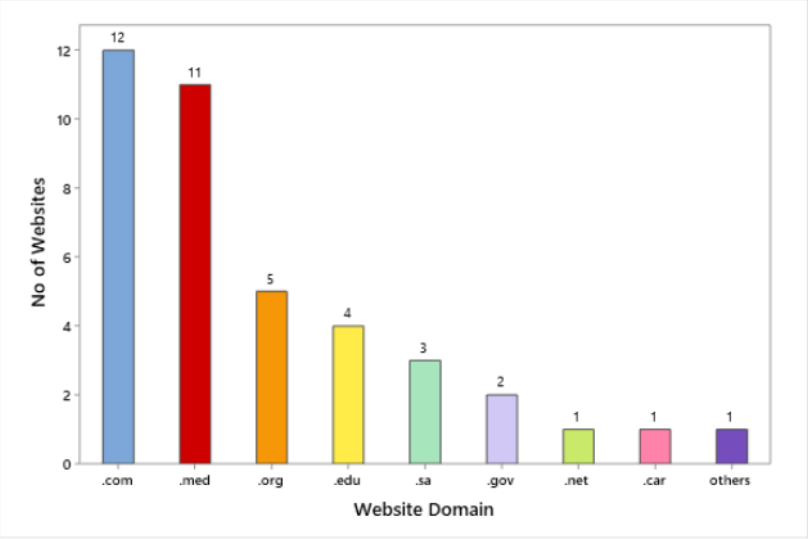


Figure 4: Domain Distribution of Sample Websites

4.1.2 Website Country

The country of origin for all the 40 selected websites was the Kingdom of Saudi Arabia. The ample consists 40 websites are from the the Kingdom of Saudi Arabia.

4.1.3 Website Sources or Administrators

The websites were categorised into five main groups in terms of administration or sources:

Commercial, health professionals, government, charity, and others. Health professionals were the most frequently appearing source making up around 43% of the total (n=17), followed by the government with 35% (n=14), Charity (n=4) and commercial websites (n=4) at 10% for each, see figure 5.

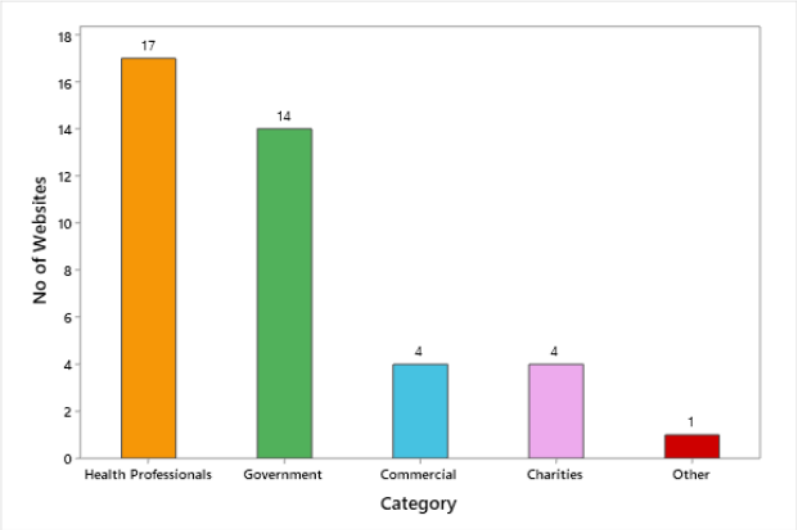


Figure 5: Website Sources or Administrators

4.1.4 Affordability for Online Discussion

Internet websites usually allow communication and discussion between users themselves, as well as with website administration. Figure 6 shows that about 62.5% (n=25) of websites in the sample do not provide online discussion, while 37.5% (n=15) provide online debate.

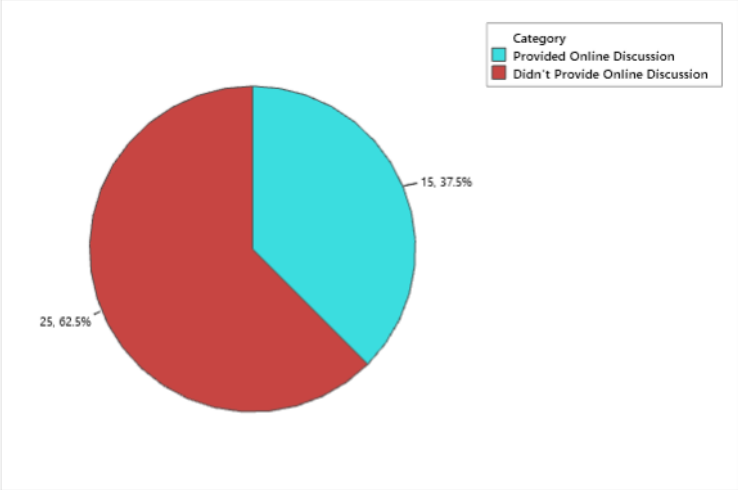


Figure 6: Website with Affordability for Online Discussion

4.1.5 Additional Assistance

Figure 7 shows that about 60% (n=24) of the sample website does not provide additional assistance for users, while 40% (n=16) provide additional assistance.

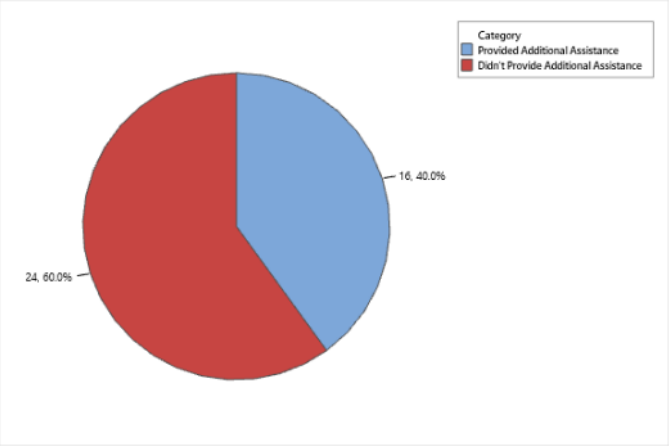


Figure 7: Additional Assistance Provision

4.1.6 Registration to Website

About 97.5% (n=39) do not require users to first register an account while only 2.5% (n=1) did required registration, see figure 8.

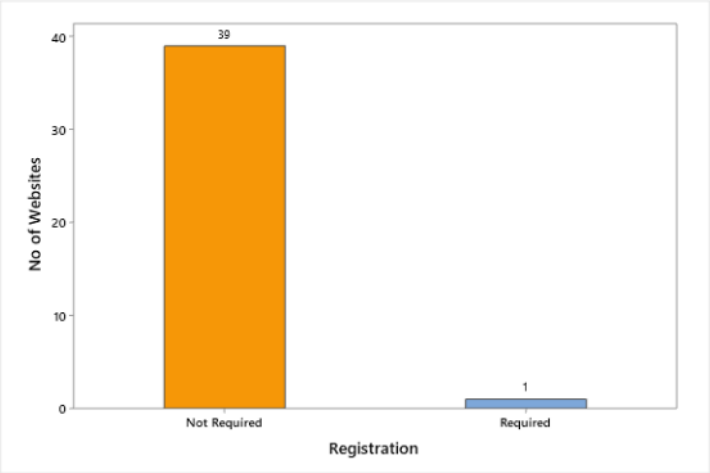


Figure 8: Registration to Website

4.1.7 links to other social media platforms

The general functionality of the website in providing a link to another social media platform was tested and analysed. All websites 100% (n=40) in the sample provided links to social media platforms like WhatsApp®, Facebook®, YouTube® and Twitter®, see figure 9.

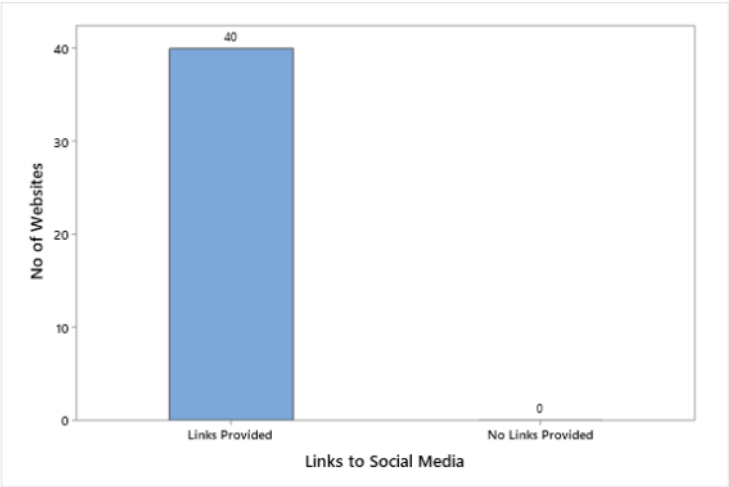


Figure 9: Links to social media

4.2 Accuracy

A series of 8 questions were administered to test the accuracy of the sampled website contents. Figure 10 represents the accuracy of medical information, namely definition, aetiology, prevalence, risk factors, symptoms, diagnosis, treatment and prevention via early identification and complications. The maximum possible score was 22, which was given to those websites that presented fully accurate medical information. Criteria within the accuracy measurement were as follows: -1 (incorrect information), 0 (absent information), 1 (partial presence of information), and 2 (clear and complete information). Analysis of accuracy score revealed that (n=26) websites had a score of zero, while (n=9) websites scored 72.72%, (n=1) website scored 31.81%, (n=1) website scored 18.18% and (n=1) website scored 4.54%, (n=2) websites scored 36.36%. Further analysis revealed that MOH, SSFCM MOHNews, WHO, SBCC, Siemens Healthineers, ANDALUSIAHJH, ASTERSANADHOSPITAL and GNP were the websites with the highest accuracy score, see figure 10.

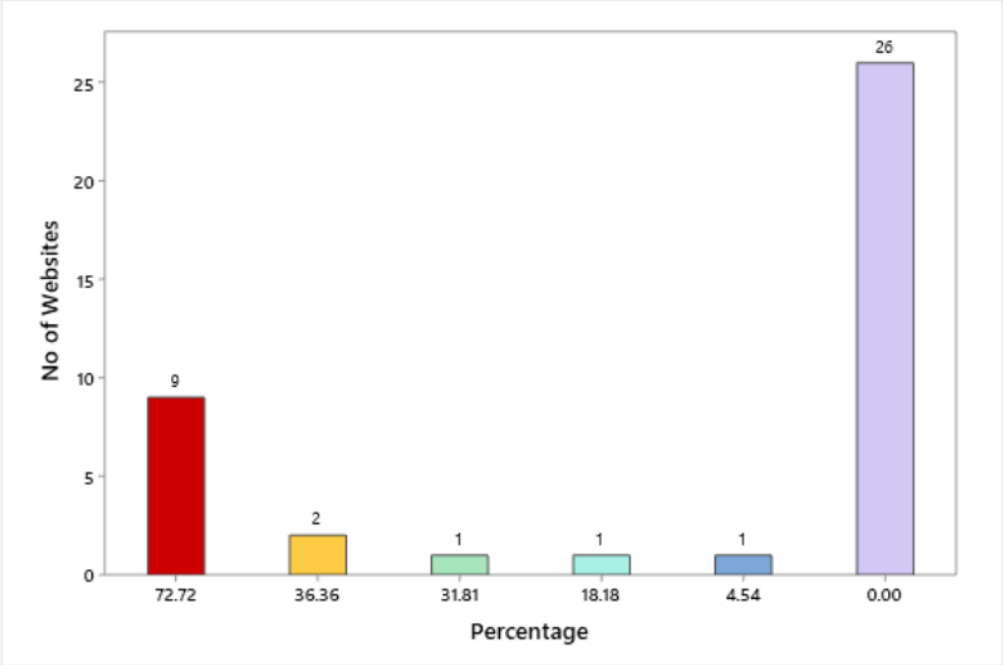


Figure 10: Accuracy Score of Websites in Relation to Medical Information

4.2.1 Definition of CVD

Cardiovascular Disease constitutes generic classification disorders that belong to a group that affect hearts and blood vessels. CVD is primarily linked with increased fatty deposits inside the arteries, atherosclerosis, along with the highest risk of blood clots (NHS, 2021). The conditions grouped under the CVD label include coronary heart disease, rheumatic heart disease, and cerebrovascular disease, among others (WHO, 2019). About 28% (n=11) of the websites in the sample touched on the definition of CVD. Of these, (n=9) websites provided a comprehensive definition of CVD, while two provided some information, see figure 11.

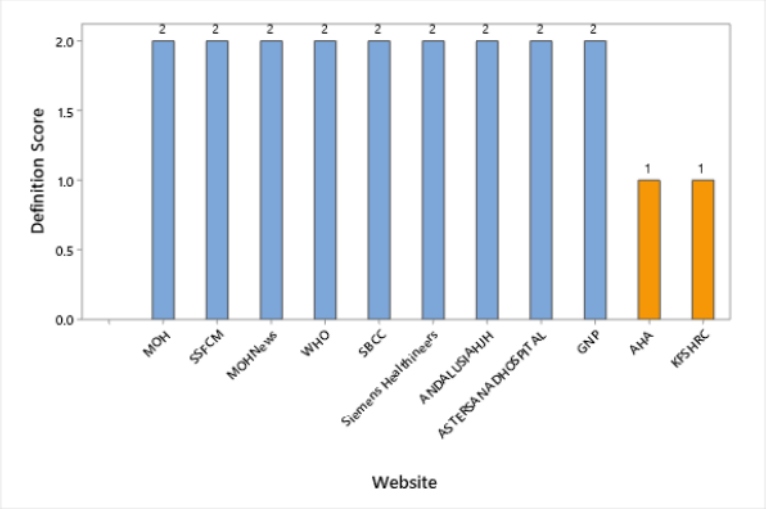


Figure 11: CVD Definition Provided

4.2.2 Aetiology of CVD

Environmental stress includes serious life upsets such as family deaths, significant lifestyle changes like divorce or job loss, chronic stress and burnout resulting from work, family or personal problems, and social media pressures. Besides, other CVD causes include biological factors like inadequate nutrition, genetic, hormonal, neurological and neuroendocrine logical issues and co-occurring disorders like medical ailments and psychological issues. About 25% (n = 10) of websites provided information regarding aetiology while 75% (n = 30) did not provide any detail on aetiology, see figure 12.

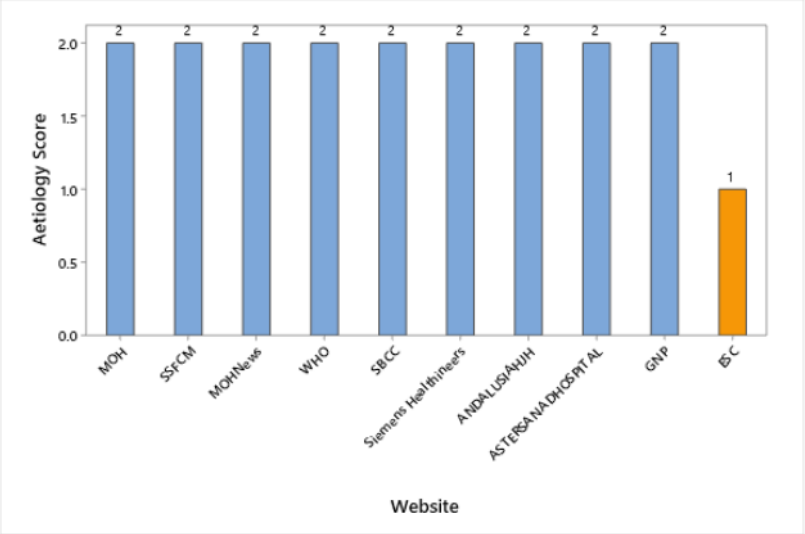


Figure 12: Websites Providing Aetiology Information

4.2.3 Risk Factors of CVD

Risk factors of CVD include lifestyle-related factors like diet, stress, substance misuse, insufficient exercise and inadequate sleep; medical problems like damage/scarring of the heart, blood vessel problems, adequate oxygen and nutrient supply to the heart, heart rhythm problems, leaky heart valves, increased blood pressure, high cholesterol, obesity and diabetes; genetic issues like the history of heart disease in the family, side effects of medication, age; and internal socio-psychological factors like anxiety and abuse, the existence of multiple personal, environmental and biological triggers (Cleveland Clinic, 2021; Felman, 2021). About 25% (n=10) comprehensively covered CVD risk factors, (n=1) website partially covered while remaining websites were silent.

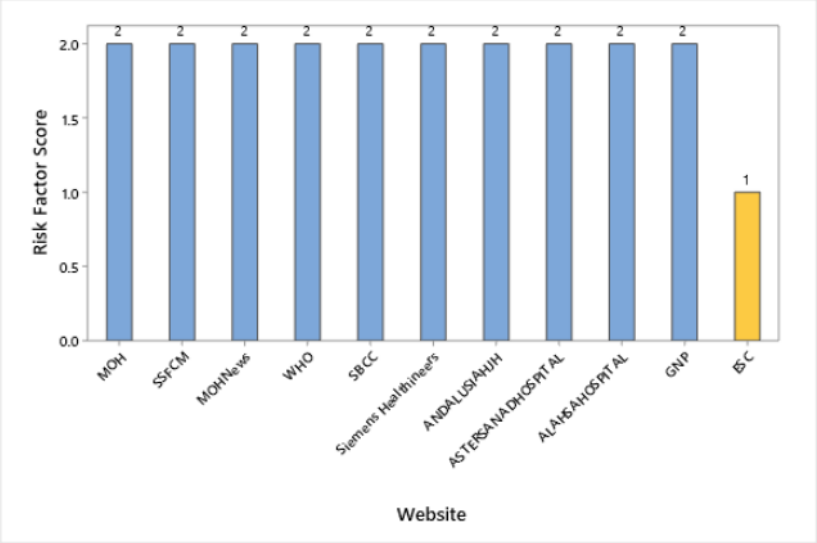


Figure 13: Website Mentioning CVD Risk Factors

4.2.4 Complications of CVD

CVD complications include death, more extended hospitalisation, physical disability, increased care costs, central nervous system issues, digestive issues, cardiovascular system problems, and immune system problems (Mayo Clinic, 2021). About 25% (n = 10) of the websites were awarded a maximum score of 2, while one website was given a score of 1, see figures 14 and 15.

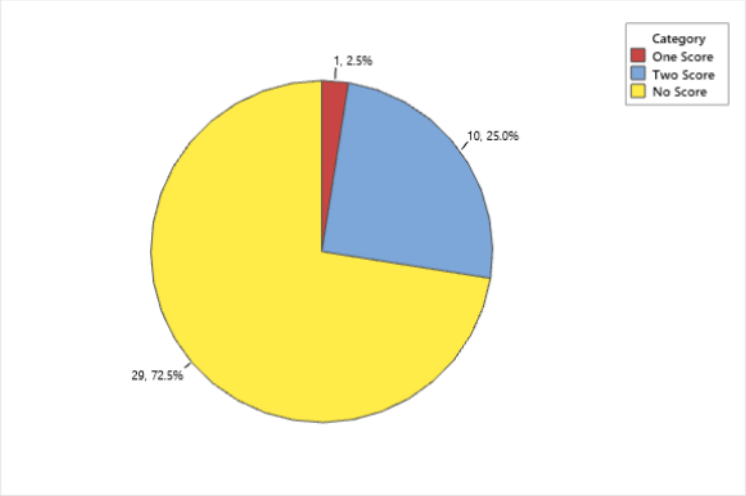


Figure 14: Information on Complications from CVD

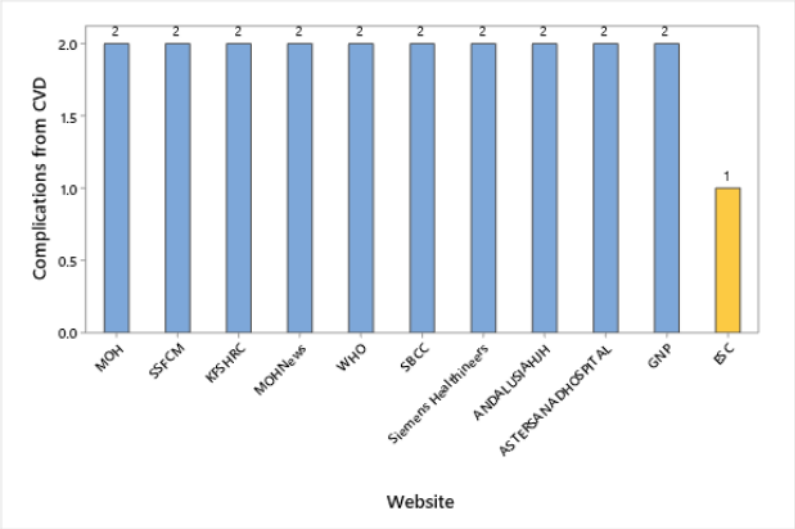


Figure 15: Website Mentioning CVD Complications

4.2.5 Prevalence of CVD

The American Heart Association (2021) highlights that there were almost 18.6 million deaths worldwide from cardiovascular disease in 2019, indicating a 17.1% increase in a decade. Furthermore, 523.2 million situations of CVD were recorded in 2019, an increase from 26.6% in 2010 (American Heart Association, 2021). Saudi Scientific Diabetes Society reported more than 50% of Diabetes Mellitus (DM) sufferers ultimately die from cardiovascular problems (Robert & Al Dawish, 2020). About 32.5% (n=13) of the websites mentioned prevalence of CVD, while 67.5% (n=27) websites did not provide any information, see figure 16.

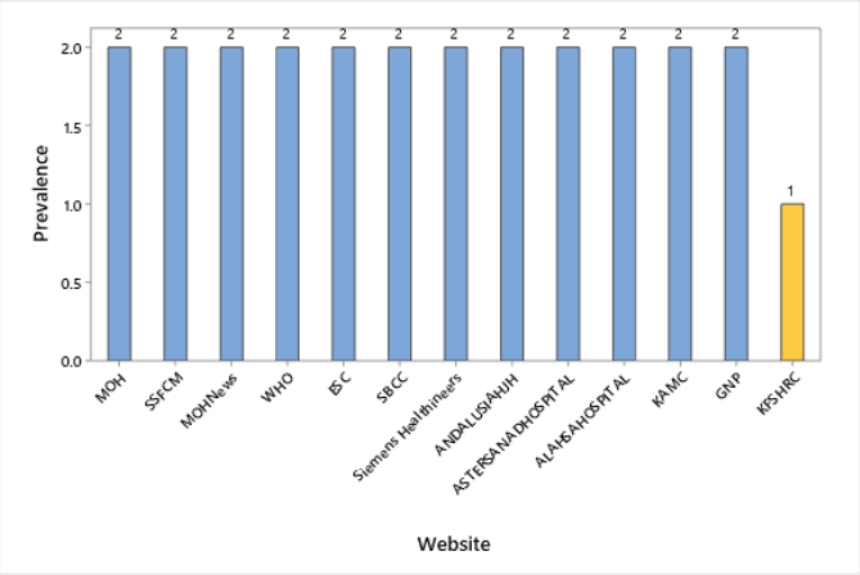


Figure 16: Websites CVD Mentioning Prevalence

4.2.6 Diagnosis of CVD

Diagnosis of CVDs involves laboratory tests and imaging studies, including blood tests, EKG/ECG (electrocardiogram), stress level testing, echocardiography, coronary angiography and cardiac catheterisation, chest x-rays, EBCT (Electron-Beam Computed Tomography) along with cardiac MRIs. Diagnosis considers a patient's medical and family histories risk factor prevalence, and physical examination (Ananya Mandal, 2019). About 27.5% (n=11) provided full information on diagnosis, 5% (n=2) provided partial ,while remaining gave no information, see figure 17 & 18.

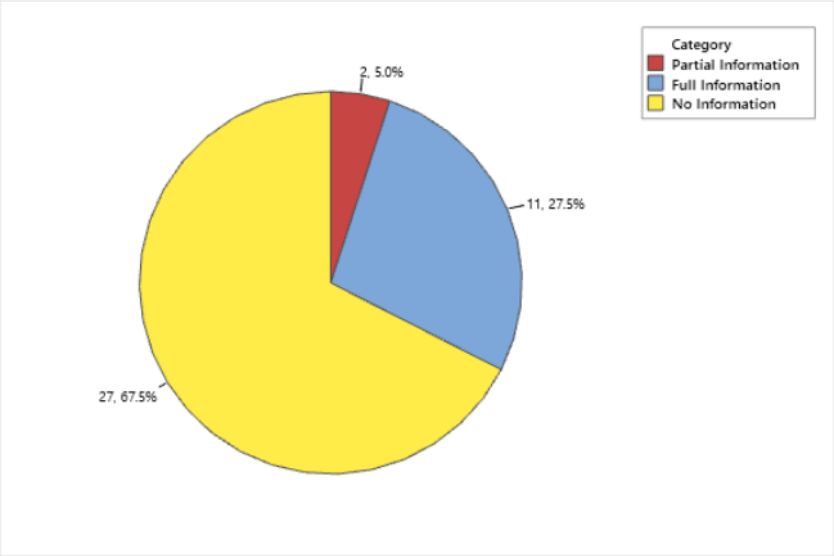


Figure 17: Percentage of websites providing information on CVD Diagnosis

4.2.7 Symptoms of CVD

Psychological symptoms include depression, anxiety, feelings of isolation, and diminished self-esteem. Social Symptoms include poorer workplace performance neglect of hobbies and interests. Social support systems can provide care and understanding, boosting esteem. Social isolation

results from avoiding friends and social events, and social problems, especially relationship issues (Everson-Rose & Lewis, 2005). About 25% (n=10) of websites gave comprehensive information on CVD symptoms; one website provided partial information, while others were silent, see figures 19 and 20.

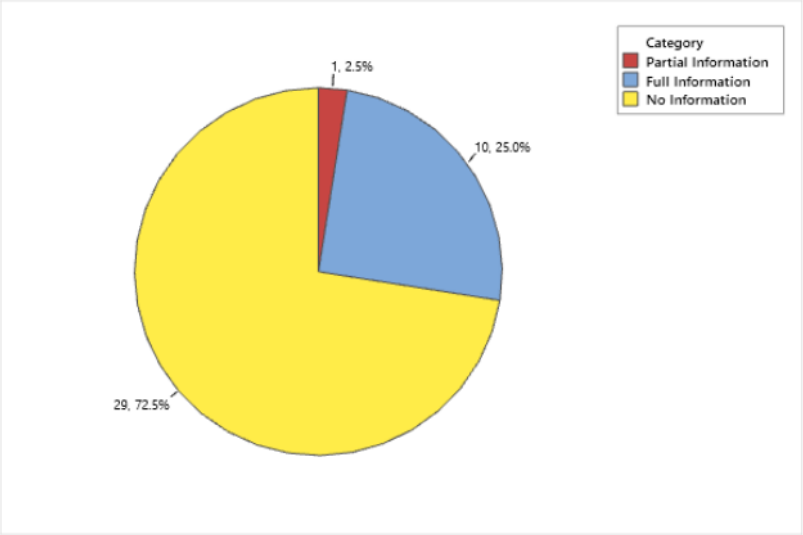


Figure 18: Percentage of websites providing information on CVD symptoms

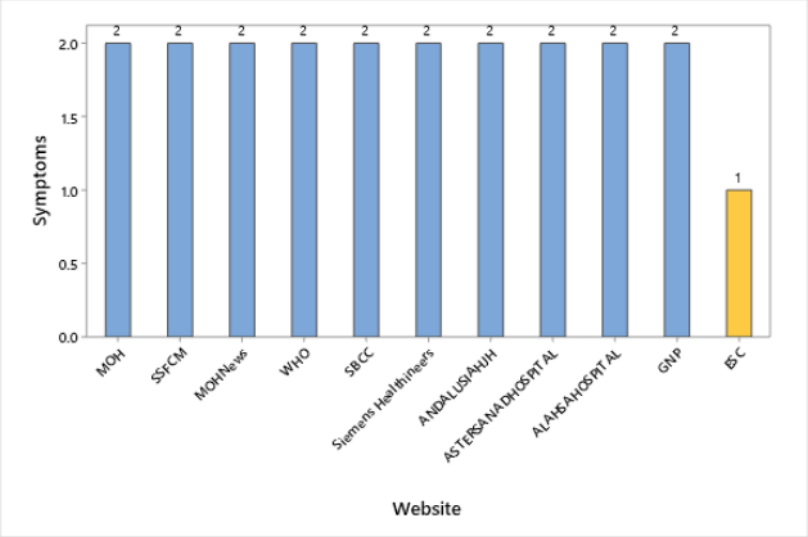


Figure 19: Website Mentioning of CVD Symptoms

4.2.8 Treatment and prevention via early identification of CVD

Treatment: Methods through early detection include pharmacological, medication, procedures, and surgery, such as a coronary artery bypass and grafting, along with valve repair or replacement surgery. Prevention via early identification includes Psychotherapeutic, s.t: (relationship therapy, setting of healthy boundaries, effective problem handling approaches), Lifestyle modifications, s.t: (regular exercise, improved social support, balanced healthy diet, good quality and quantity of sleep, reducing stress, no smoking, maintenance of optimal blood pressure, along with normal LDL-cholesterol and glucose levels. Alternative and complementary treatments include vitamins and supplements. (Backer, 2017). About 30% (n=12) mentioned CVD treatment through early disease recognition. 92% (n=11) provided full information obtaining maximum score of 2, while 8% (n = 1) were each given a score of 1, see figure 21.

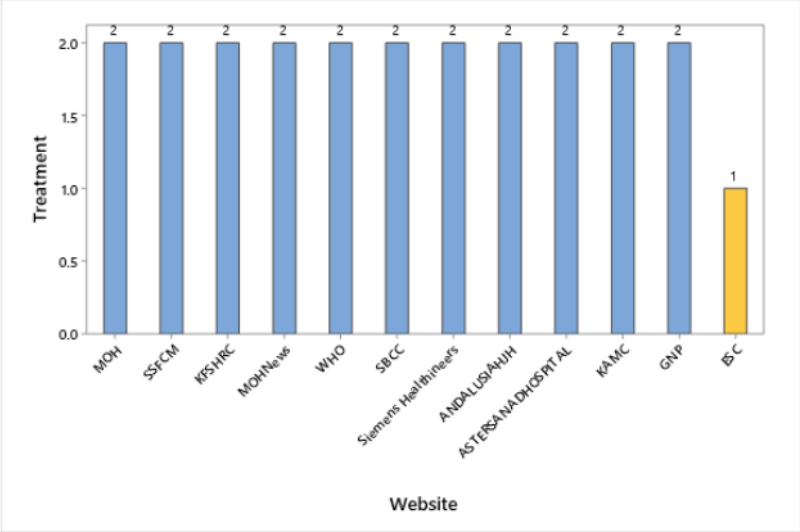


Figure 20: Websites mentioning CVD Treatment

4.3 Transparency

A series of 5 items were administered to test the transparency of the data. Clarity was measured through nineteen questions. The maximum scores for the questions varied between 1 and 2. A website that offered full transparency could have achieved a top score of 38 for all items. The measured items included authorship, complementarity, attribution, disclosure, and currency. The assessment of the transparency of the provided data on the 40 selected websites was undertaken by reference to the requirements of the Health on the Net Foundation award (HON, 2020). This outlines six recommended standards a website should display if it is to be considered transparent. Accordingly, the information on each website was assessed by reference to these six requirements. The specific areas which were assessed were: Authorship – namely, were all authors and contributors, their affiliations and interests, along with all relevant credentials, provided? (5 questions, with a possible maximum score of 9.) Attribution – were the sources used for the

provided information referenced and detailed, with all relevant copyright information also provided? (4 questions; possible maximum score of 7.) Currency – were the dates when the content was first published and subsequently updated provided? (3 questions; a possible top score of 4.) Disclosure – was the website ownership fully and prominently disclosed, alongside advertisement, underwriting, sponsorship, commercial funding and potential conflicts of interest? (This includes linking to external sites for commercial gain; disclosure also applies to discussion forums.) (6 questions; a possible maximum score of 7). Complementarity -- was the information on the website designed to support rather than replace the relationship between a patient/site visitor and his/her doctor/other medical professionals? (1 question; a possible maximum score of 1). Kitemarks – was the usage of Kitemarks noted, and were these marks verifiable? Moreover, were the requirements for the Kitemark award easily accessible, does the body which awards the mark still exist and does said body examine the website content for accuracy? (5 questions; a possible maximum score of 5).

Siemens Healthiness website in the sample is the least transparent website, with a score of 42.10% for the transparency of the medical information supplied, while MOHNews indicated 81.57% transparency. Overall, 70% (n=28) of sample websites indicated transparency more significant than 70%, see figure 22.

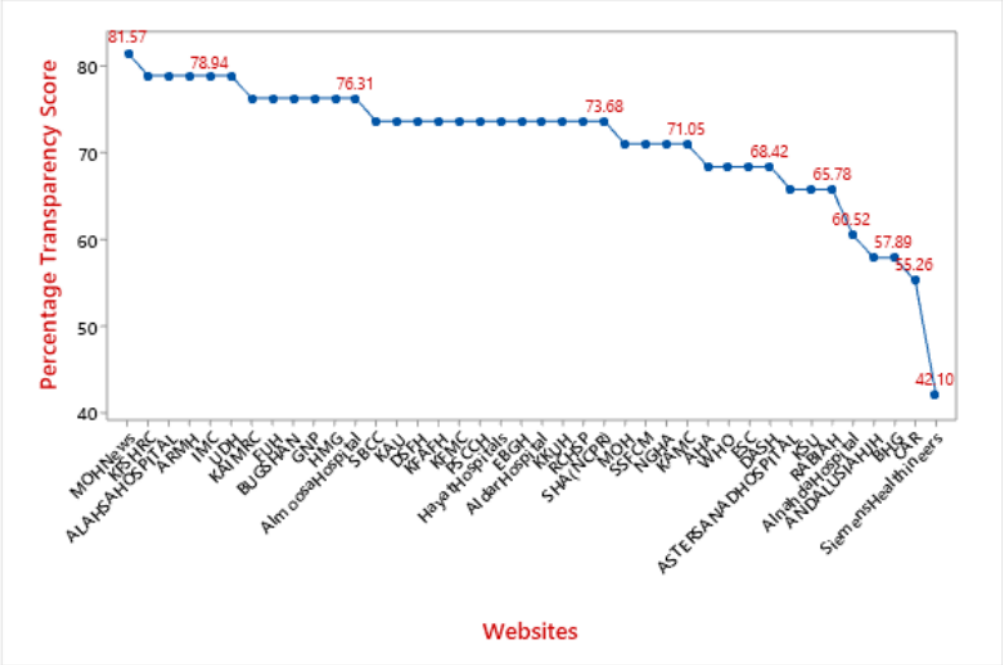


Figure 21: Websites Transparency

4.3.1 Authorship

Regarding the answer to the question "Is there disclosure of authorship?", 95% (n=38) of the sample of 40 websites provided information on authorship, while 5% (n=2) did not declare anything about their authorship, see figure 23.

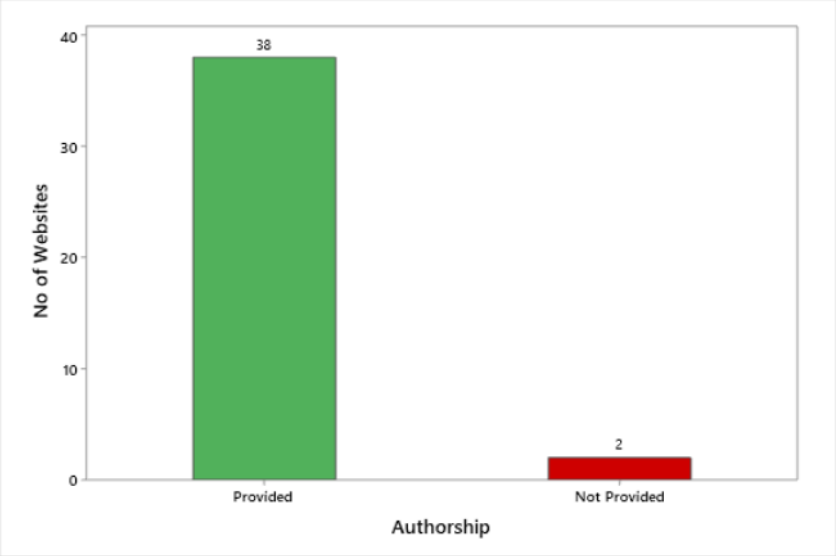


Figure 22: Website Authorship

4.3.2 Disclosure of Author Credentials

Figure 24 details the disclosure of author credentials for the 40 websites in the sample. About 98% (n=39) disclosed author credentials, while only 2% (n=1) did not.

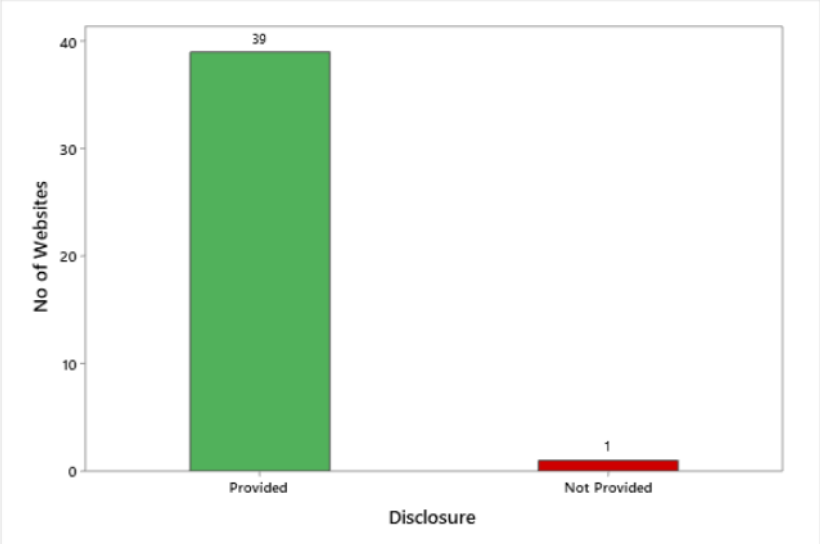


Figure 23: Website Disclosure of Author Credentials

4.3.3 Author is Healthcare Professional or Expert

97.5% (n=39) of website authors were a healthcare professionals or experts, while 2.5% (n=1) did not was a healthcare professionals or experts, see figure 25.

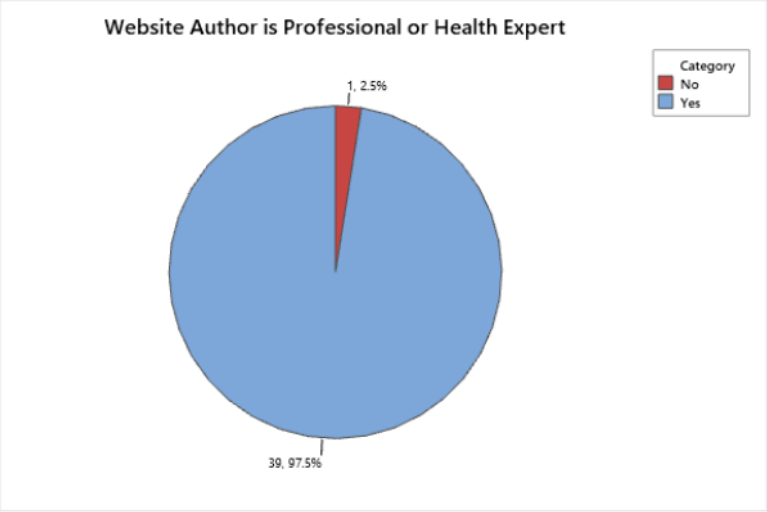


Figure 24: Websites Author Expertise

4.3.4 Verifiable Credentials

Results show that 100% (n=40) of the websites had verifiable credentials. Thus, were awarded a maximum score of 2 in this aspect.

4.3.5 Author Contact Details

Figure 26 shows how many websites provided author contact details. 90% (n=36) of the websites provide author contact details, while 10% (n=4) did not.

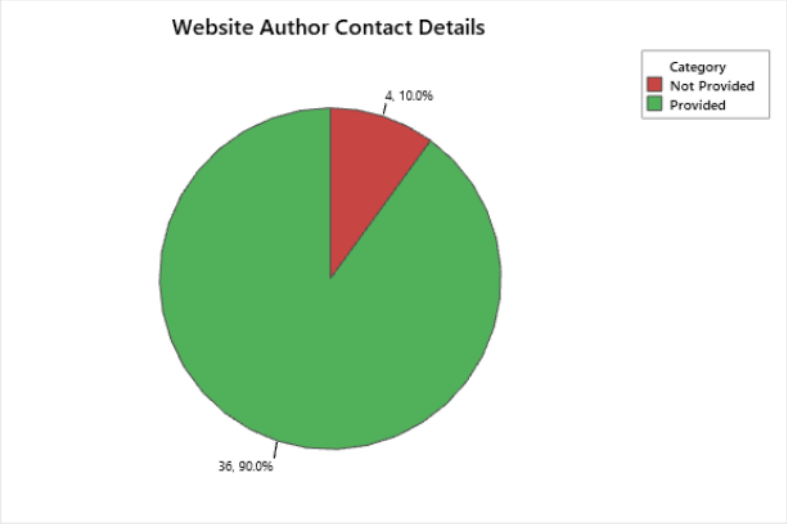


Figure 25: Website Author Contact Details

4.3.5 Attribution

Attribution is concerned with whether sources for all content are clearly referenced with all relevant copyright information. There was a series of 4 questions that helped determine the attribution of websites. About 97.5% (n=39) of the websites have 100% attribution, while 2.5% (n=1) of websites have about 86%, see figure 27.

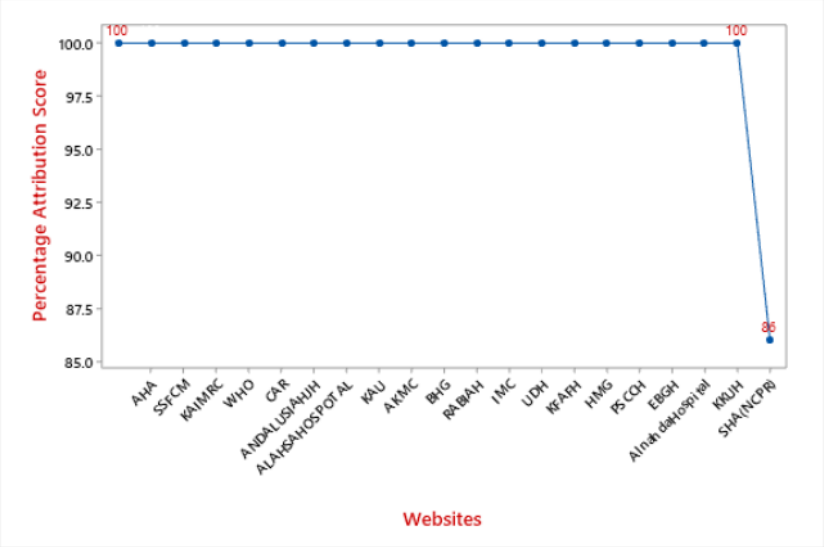


Figure 26: Levels of attribution

4.5.1 Information Source Clearness

Results show that 100% (n=40) of the websites have information source clearness and were awarded a maximum score of 2.

4.5.2 Reference Available

Results show that 100% (n=40) of the websites included references for information and were awarded a maximum score of 2.

4.5.3 Include Opinions

Data analysis showed that 100% (n=40) of the websites include opinions in their content and were awarded a maximum score of 2.

4.5.4 External Links

97.5% (n=39) of the websites have external links to scientific reference material/studies, while

only Siemens Healthiness website (2.5%) has no external link, see figures 28.

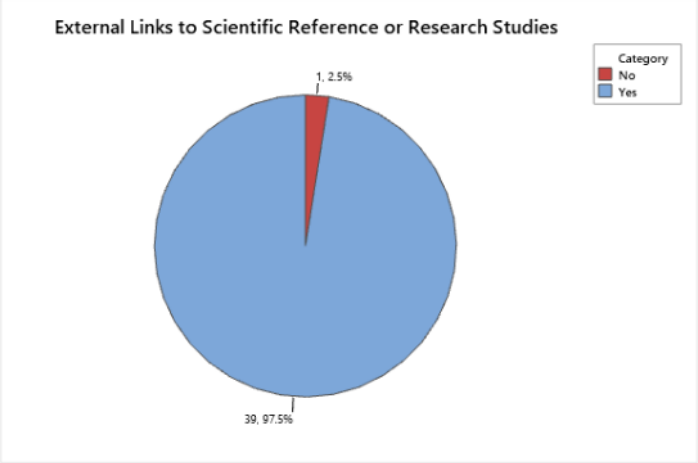


Figure 27: Websites External Links

4.3.3 Currency

A series of 3 questions helped determine the currency of the websites. About 23% (n=9) of the websites have 100% currency, KFSHRC and ESC websites in the sample of-websites have 50% of currency. ALAHSAHOSPITAL website has 43.75% of currency, KAMC website has 25% of currency, while AHA website in the sample has 6.25% of the currency, see figure 29.

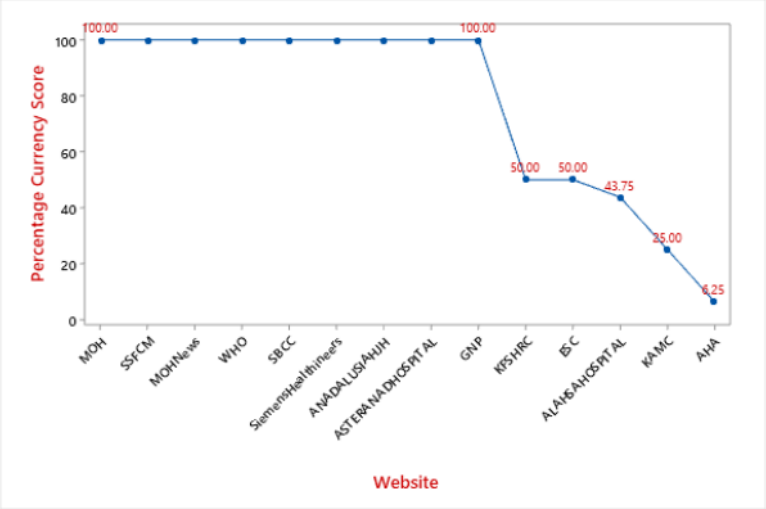


Figure 28: Levels of currency

4.6.1 Date Type

Data analysis shows that 100% (n=40) of the websites give the date for creating each page and were awarded a maximum score of 2.

4.6.2 Date of the last update

Results show that 100% (n=40) of the websites have date of the last update and were awarded a maximum score of 2.

4.6.3 Website Updated in Last 4 Months

Data analysis shows that 100% (n=40) of the websites have been updated in the last 4 months. thus, were awarded a maximum score of 2 in this aspect.

4.3.4 Disclosure

A series of 6 questions helped determine the disclosure of the websites. Figure 30 shows websites disclosure scores, which ranged 0.787% – 4.724%. From the figure, the ALAHSAHOSPITAL website has the higher score with 4.724%, while CAR and BHG websites had the lowest scores, with 0.787%.

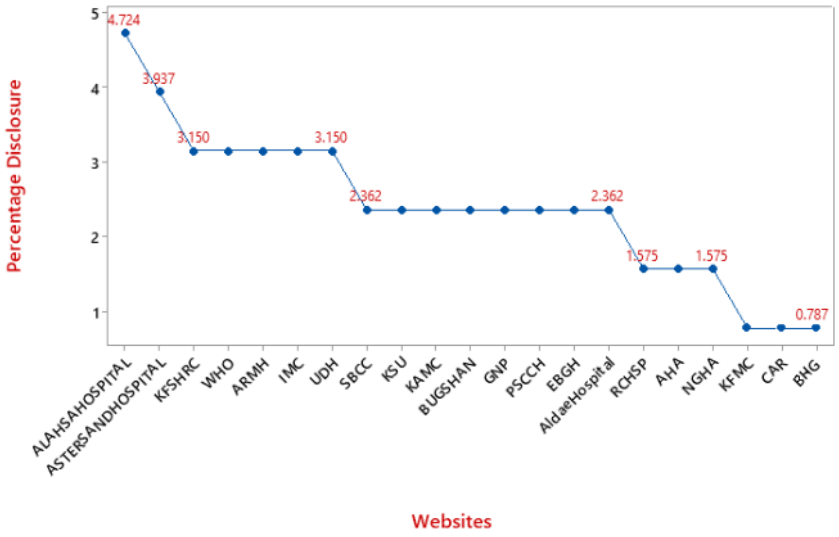


Figure 29: Websites Disclosure

4.7.1 Source of Funding Clearly Stated

95% (n=38) of the websites did not state the source of funding, while 5.0% (n=2) of the websites state source of funding, see figure 31.

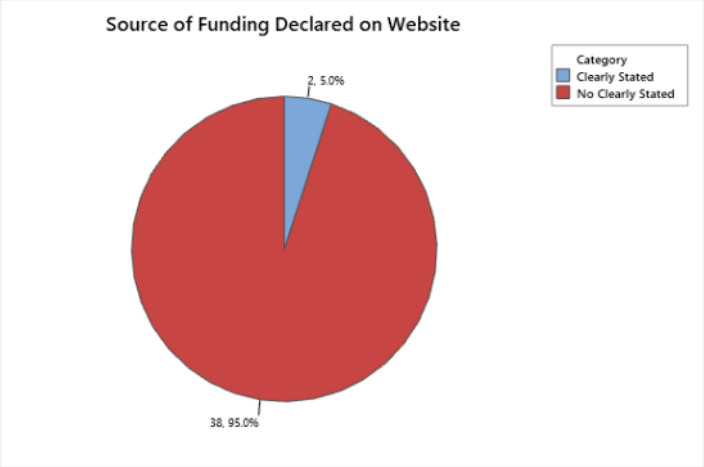


Figure 30: Source of Funding Clearly Stated

4.7.2 Selling a product(s)

20% (n=8) of the websites were selling a product(s), while 80% (n=32) did not selling any product(s), see figure 32.

Figure 31: Selling a Product(s)

4.7.3 Does the Website Carry Adverts?

Results show that 92.5% (n=37) of the websites carried adverts, while 7.5% (n=3) of the websites did not, see figure 33.

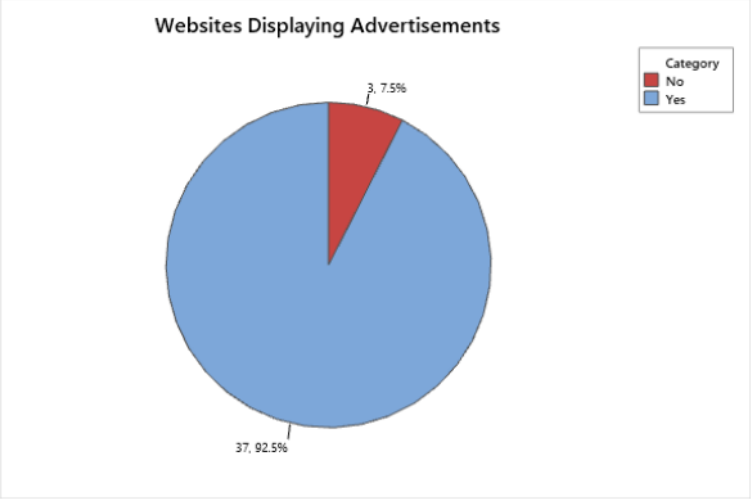


Figure 32: Carrying Adverts

4.7.4 Does the Website Allow Pop-ups?

85% (n=34) of the websites allowed pop-ups, while 15% (n=6) of the websites did not, see figure 34.

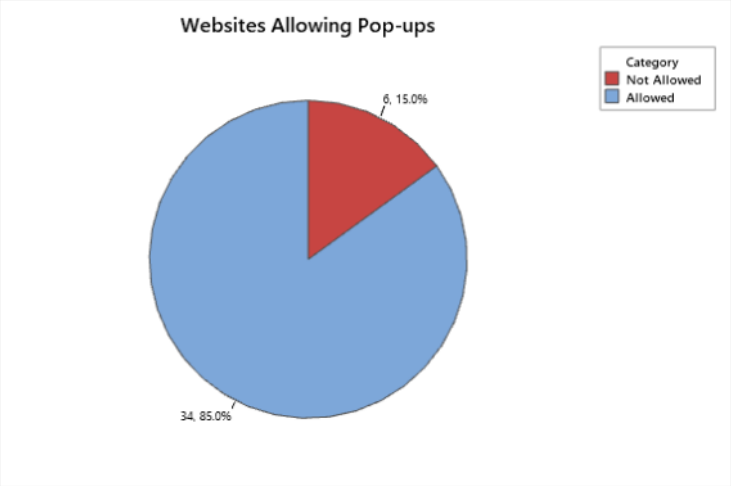


Figure 33: Allowing Pop-ups

4.7.5 Clearness of Privacy Policy

52.5% (n=21) of the websites have a clearness of privacy policy, while 47.5% (n=19) of websites do not have clearness of privacy policy, see figure 35.

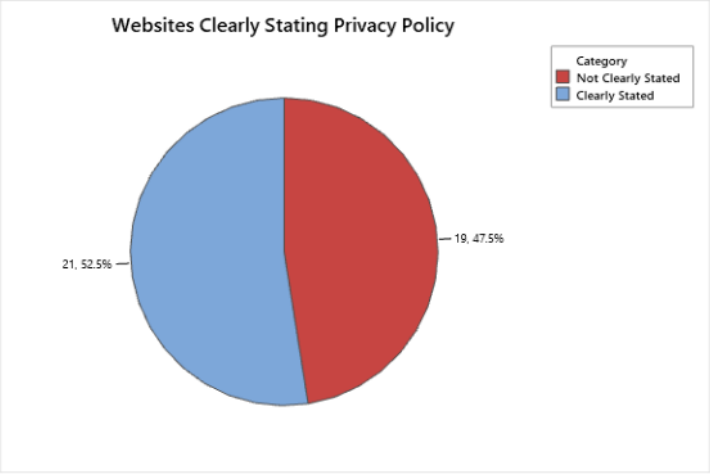


Figure 34: Clearness of Privacy Policy

4.7.6 Leaking personal information

57.5% (n=23) of the websites disclosed and sold personal information, while 42.5% (n=17) of the websites did not, see figure 36.

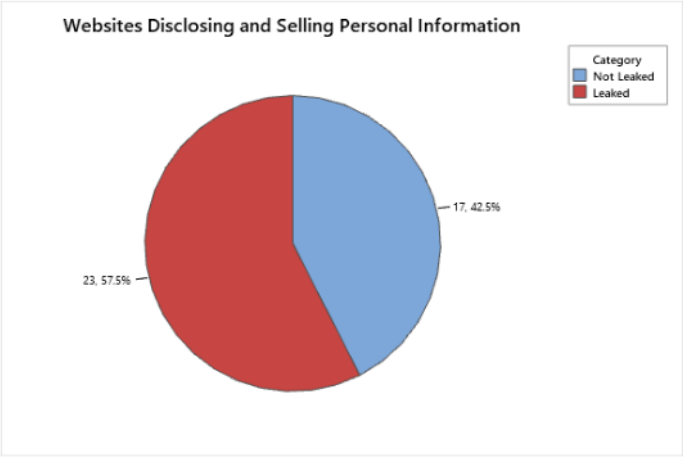


Figure 35: Leaking personal information

4.3.5 Complementarity

The information on the website must be intended to supplement rather than replace the relationship between a patient/site visitor and their doctor/other health professionals (HON, 2020). One question determined the complementarity of websites.

4.8.1 Request for Advice Regarding CVD

In this section, ‘’a discussion if there are statements confirming a request from a physician, nurse, or other healthcare professional for further advice regarding CVD?’’. Total of 19 websites (48%) of the 40 websites scored 100% for full complementarity transparency, however 21 websites (52%), as indicated in table 4 below to include this information.

Website Name	Website number
CAR	9
SBCC	10
Siemens Healthineers	11
ANDALUSIAHJH	12
ASTERSANADHOSPITAL	13
ALAHSAHOSPITAL	14
KSU	15
KAU	16
NGHA	17
RABIAH	22
DASH	25
KFAFH	28
PSCCH	32
HayatHospitals	33
EBGH	34
AlmoosaHospital	35
AlnahdaHospital	36
AldarHospital	37
KKUH	38
RCHSP	39
SHA (NCPR)	40

Table 4: Websites failing to include complementarity

4.3.6 Kitemarks/Awards

There were 5 questions that helped determine the Kitemarks of the websites. within the data collection tool, offering a maximum score of 5. Figure 36 shows Websites Kitemarks (Awards) with a range (0.000% – 3.356). Further, HONcode certification were not found on the Saudi Arabian websites.

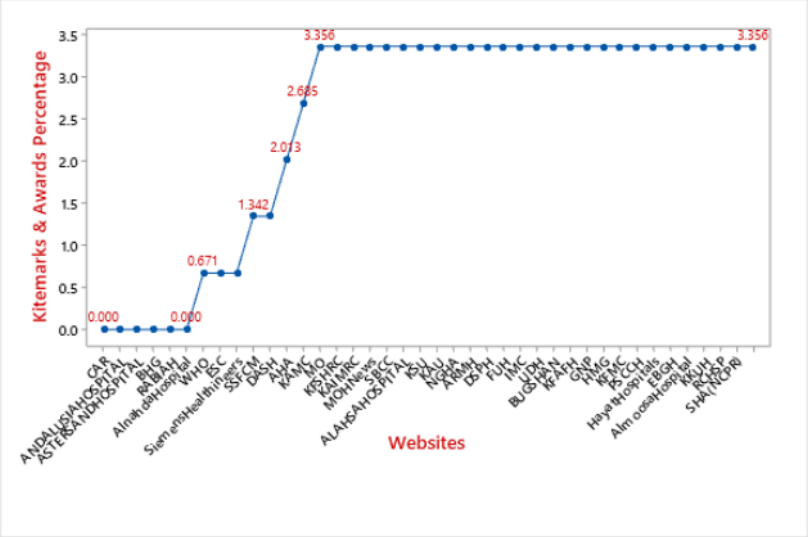


Figure 36: Websites Kitemarks (Awards)

4.9.1 Health Related Kitemarks/Awards

About 68% (n=28) of websites have 100% of kitemarks/awards, while 15% (n=6) of websites have 0% of kitemarks/awards. MOHNews and KFSHRC website have 80% of kitemarks/awards, KAMC and DASH websites have 40%, while WHO website and SiemensHealthineers website have 20% of kitemarks/awards, see figure 38.

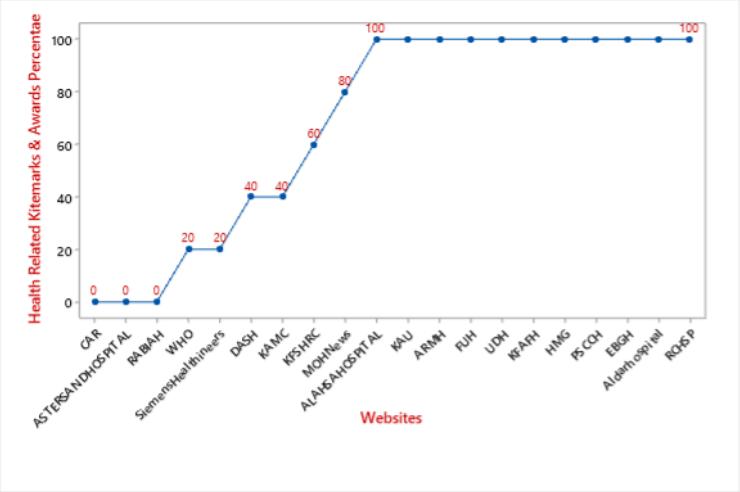


Figure 37: Websites with Health Related Kitemarks/Awards

4.9.2 Kitemarks/Awards Verifiable

The data show 72.5% (n=29) of the websites had verifiable Kitemarks/Awards, while 27.5% (n=11) of websites did not, see figure 39.

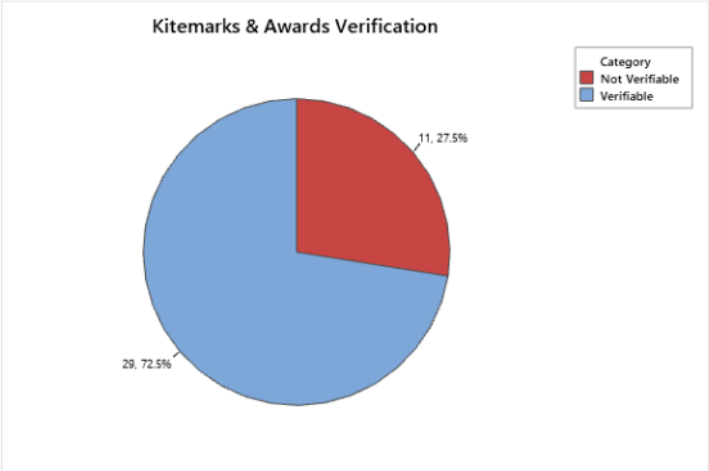


Figure 38: Websites with Verifiable Kitemarks/Awards

4.9.3 Criteria for Winning the Award

Figure 40 shows that 70% (n=28) of the websites had the criteria for winning the award, while 30% (n=12) of websites did not.

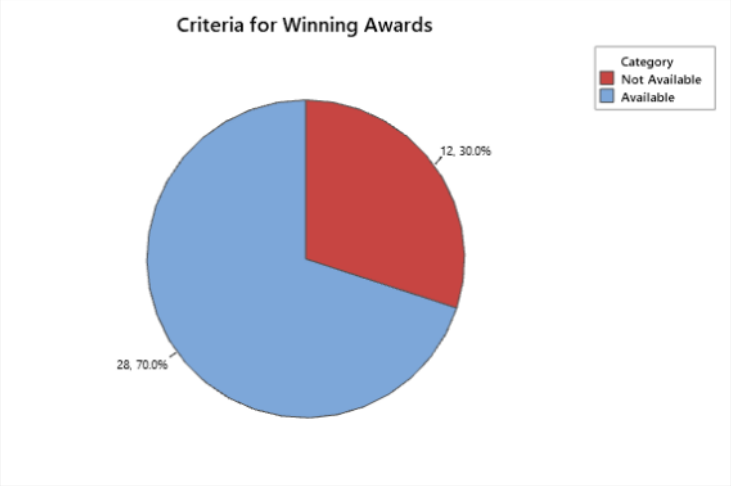


Figure 39: Criteria for Winning the award

4.9.4 Does the Awarding Organisation Still Exist?

77.5% (n=31) of the websites cited an awarding organisation that still exists, while 22.5% (n = 9) of the awarding Organisation no longer exists, see figure 41.

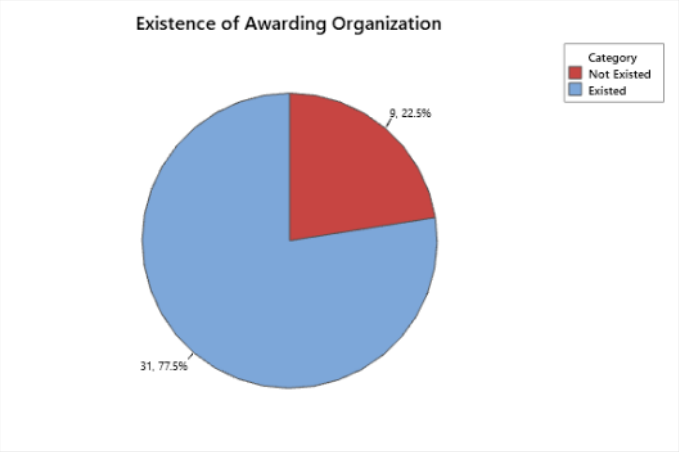


Figure 40: Status of the Awarding Organization

4.9.5 Analysis of the Content of the Awarding Body for Accuracy

82.5% (n = 33) of the websites contained an analysis of awarding body content for accuracy, while 17.5% (n = 7) of the websites did not have an analysis of awarding body content for accuracy, see figure 42.

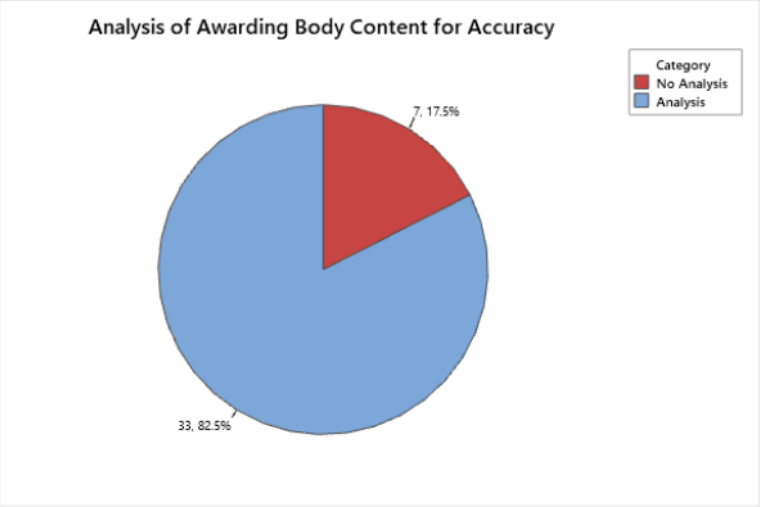


Figure 41: Analysis of the Content of the Awarding Body for Accuracy

4.4 Readability

The readability levels of each of the websites were measured using the (FRE) test and the (FKG) level test (Microsoft Office, 2016). The formula used to determine the (FRE) score is: 206.835 – (1.015 ×ASL) – (84.6 ×ASW)- 15.59. Where:

ASL = average sentence length (the number of words divided by the number of sentences).

ASW = average number of syllables per word (the number of syllables divided by the number of words).

The (FRE) test rates text on points out of 100. Scores that are higher indicate an easier read. The text is to understand. The ideal score for most standard files is between 80 and 90. Therefore, the text should become easier to read as the score increases. The study sample ranged from website 21; DSFH, with a reading level of 19.4 to website 28; KFAFH with a reading level of 118.

Flash Reading Ease Score	Estimated Readability Grade	Readability Level
0.0-30	College graduate	Very difficult to read. Best understood by university graduates.
30-50	In College	Difficult to read
50-60	10th to 12th grade	Fairly difficult to read.
60-70	8th & 9th grade	Standard/ Plain English. Easily understood by 13–15-year-old students.
70-80	7th grade	Fairly easy to read.
80-90	6th grade	Easy to read. Conversational English for consumers
90-100	5th grade	Very easy to read. Easily understood by an average 11-year-old student.

Table 5: Flesch Reading Ease Level Scores (Rahmad et al., 2016)

The mean reading score for the 40 websites in the study sample was 83.14, see figure 43 below. As the FRE score aims for texts to fall between a score of 80 and 90, indicating that the average website text within this sample is "easy" per the scale in table 5.

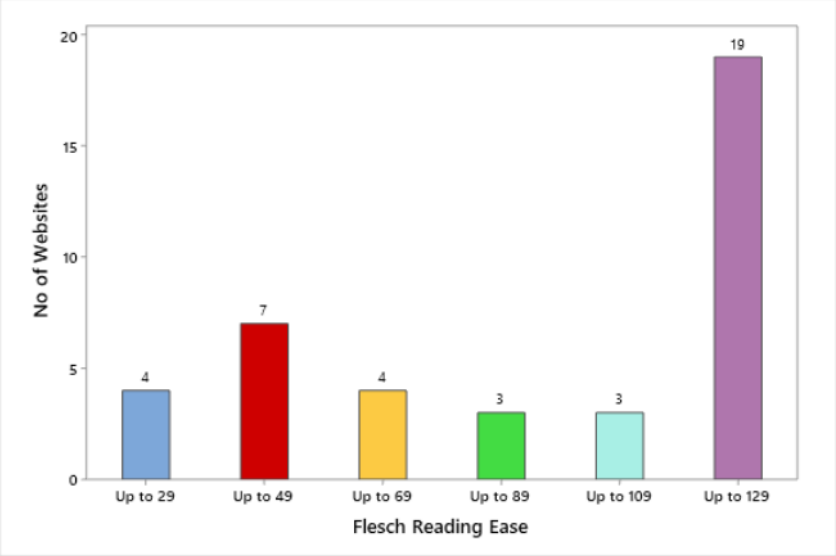


Figure 42: Flesch Reading Ease

The FKG level test rates text in line with the United States of America school grades. In the United States the range (0-10) interprets as "Extremely difficult to read. Best understood by university graduates". In the current study, the mean grade level score was 3.05; therefore, the results for the whole study sample did not meet the recommended level. The study sample ranged from website 28; KFAFH, with a grade level of -2.3 to website 31; KFMC with a grade level of 11.3, see figure 44.

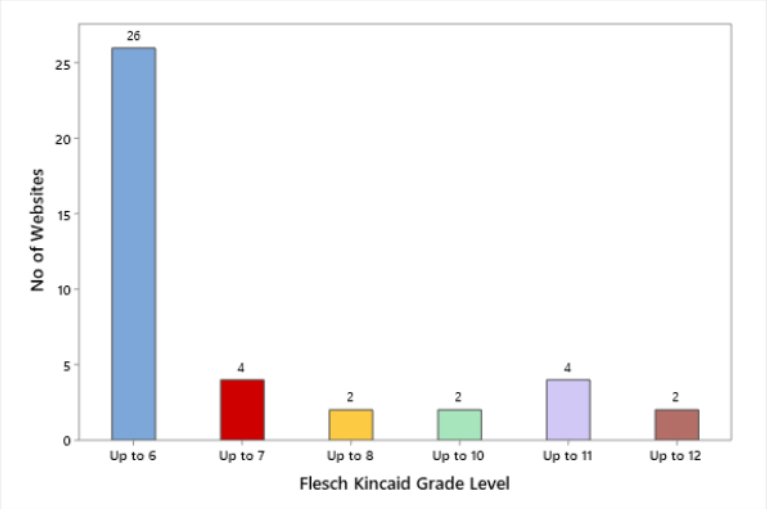


Figure 43: Flesch Kincaid Grade Level

4.5 Navigability

Navigability was analysed via an assessment of the ease users to access information by following links on the website homepage. Per the criteria in Sandvik (1999), the scoring index was as follows:

- Information found with ease by following links to the website homepage = 2
- Information found but with difficulty =1
- Content spread around; no search engine provided = 0

Each criterion had a potential score of 2, 1, or 0. The assessments revealed that the selected website displayed very good navigability. All 40 websites contained links that could easily be found from the homepage. Therefore, the results indicate that 100% (n=40) of the selected websites have a navigability character score of 2.

4.6 Statistical analysis

SPSS v27 was used to conduct inferential statistical analysis of the data collected on 40 websites based on the framework by England & Nicholls (2004), see appendix D.

4.6.1 Descriptive Statistics

Descriptive statistics from the data collections are reported as mean and standard deviation. The mean is the measure of the central tendency of the data set and tells us "How much will be the average rating of the quality parameter if equally divided among all websites". Mean values for Accuracy, Transparency and Navigability are 0.538, 1.095 and 2 respectively. Standard deviation is the spread of data from the average value and determines how far an observed value is from the mean and is represented by the Greek letter "σ"[1]. In this case, standard deviation tells "how different is a particular quality item rated for a website from the average value of rating for that item". Accuracy indicated a standard deviation of 0.839 while Transparency has a standard deviation of 0.135. A low standard deviation of Transparency indicates the closeness of the observed values to the mean value than for the Accuracy quality parameter. While a standard deviation of 0 as for navigability suggests that all websites were ranked equal. Skewness is the measure of symmetry or in more appropriate words measure asymmetry in the data. A negative skewness of -0.986 for Transparency indicates a left skewed data (tail on left) while a positive skewness of 1.108 for Accuracy indicates a right skewed data (tail on right), see table 6.

Descriptive Statistics

	N	Mean	Std. Deviation	Skewness	
	Statistic	Statistic	Statistic	Statistic	Std. Error
Accuracy	40	.53750	.839337	1.108	.374
Transparency	40	1.09493055555 5556	.134451754380 870	-.986	.374
Navigability	40	2.00	.000	.	.
Valid N (listwise)	40				

Table 6: Descriptive Statistics of Accuracy, Transparency and Navigability Ratings

Similarly, table in appendix H shows item-wise descriptive statistics of all the main and sub quality items rated during the assessment. The results revealed that Question No 18, 22, 23, 24 and 26 had the highest mean rating while Question No 29 and 30 had the lowest ones.

4.6.2 Correlation Analysis

Correlation analysis uses Pearson's Coefficient of Correlation denoted by r to determine the strength of association between two variables. Following value ranges of Pearson's Coefficient are used to measure the strength of association, see table 7:

Coefficient Value	Strength of Association
$0.1 < r < 0.3$	Small Correlation
$0.3 < r < 0.5$	Moderate Correlation
$r > 0.5$	Strong Correlation

Table 7: Strength of Correlation Analysis

In this study, the significance level was kept at 0.05 ($\alpha = 0.05$) , which means there is a 5% risk of concluding a correlation between two items when it does not exist. Correlation analysis suggested

that there is a strong positive relationship between authorship and attribution (r=0.897, p-value<0.01) whereas a moderate positive correlation existed between website characteristics and complementarity (r=0.462, p-value<0.01). Website characteristics suggested a small positive correlation with Authorship (r=0.185, p-value<0.05), Attribution (r=0.134, p-value<0.05) and Kitemarks (r=0.276, p-value<0.05) while it depicted a small negative correlation with currency (r=-0.134, p-value<0.05). Accuracy revealed a small negative correlation with Authorship (r=-0.212, p-value<0.05), Attribution (r=-0.283, p-value<0.05), Currency (r=-0.104, p-value<0.05) and Kitemarks (r=-0.295, p-value<0.05) while it has small positive correlation with disclosure (r=0.194, p-value<0.05) and complementarity (r=0.146, p-value<0.05). Both complementarity and Kitemarks had a small positive correlation with Authorship and Attribution while a small negative correlation can be seen with currency. However, the currency has shown a small positive correlation with disclosure (r=0.126, p-value<0.05). Complementarity has shown a small positive correlation with Kitemarks (r=0.132, p-value<0.05). Appendix I shows the correlation between website quality items assessed where strong correlation is shown in green colour, moderate in blue and small correlation in yellow colour for visual depiction and easy comprehension/ reference.

4.6.3 Kendall's Coefficient of Concordance

Kendall's Coefficient of Concordance (W) is a measurement to determine the agreement between various participants rating the website quality and ranges from 0 to 1 where zero indicates a perfect disagreement and 1 depicts a perfect agreement, see table 8.

Coefficient Value	Interpretation
0	No Agreement
0.10	Weak Agreement
0.30	Moderate Agreement
0.60	Strong Agreement
1	Perfect Agreement

Table 8: Criteria for Interpretation of Kendall's Coefficient

Results from SPSS revealed Kendall's W value of 0.751 where p-value is less than the significance level 0.05 (p-value=0.000<0.05). This suggested that a strong agreement exists on the rating the quality of websites, see table 9.

Test Statistics

N	40
Kendall's W[a]	.751
Chi-Square	210.316
df	7
Asymp. Sig.	.000

a. Kendall's Coefficient of Concordance

Table 9: Kendall's Coefficient

Table 10 shows the inter ranking of website quality parameters. Here, the navigability was ranked highest compared to other items while complementarity was ranked the lowest.

Ranks

	Mean Rank
Accuracy	2.86
Authorship	6.58
Attribution	5.90
Currency	4.83
Disclosure	2.55
Complementarity	2.38
Kitemarks	3.03
Navigability	7.89

Table 10: Ranking of Website Quality Ratings

4.6.4 Kruskal-Wallis Test

The Kruskal Wallis test, also referred to as One-Way ANOVA, was used to compare the mean readability levels between all websites, i.e. com, gov, org, etc. Kruskal-Wallis test, is used to identify if a statistically significant difference exists between two or more groups. A statistically significant difference in readability could not be found between the groups according to Kruskal-Wallis H tests of websites with a mean rank score of 21.42 for com, 23.18 for med, 16.25 for edu, 17.70 for org, 21.25 for gov, 14.33 for sa and 23.00 for others, see table 11.

Ranks

	Website Group	N	Mean Rank
Readability	COM	12	21.42
	MED	11	23.18
	EDU	4	16.25
	ORG	5	17.70
	GOV	2	21.25
	SA	3	14.33
	OTHERS	3	23.00
	Total	40	

Test Statistics[a,b]

	Readability
Kruskal-Wallis H	2.454
df	6
Asymp. Sig.	.874

a. Kruskal Wallis Test

b. Grouping Variable: Website group

Table 11: Kruskal-Wallis H Test

4.7 Summary

Data collected from the survey were analysed statistically 40 websites showed that the websites in the study sample that are visited to search about the information on cardiovascular diseases differ in respect to their accuracy, transparency, ease of navigation and ease of reading. After analysis, websites with domain .com were found to be the most frequent (n=12), main up around 30% of the total sample, followed by the websites with the. med domain (n=11), amounting to 27.5%. The results showed that health professionals were the most frequent websites source, making up about 43% (n=17) of the sample. They were followed by government sources, which made up 35% (n=14), Charity (n=4) and commercial websites (n=4) at 10% for each. Moreover, 40% (n=16) of the websites provide additional assistance for users, with 62.5% (n=25) of websites in the sample not providing online discussion. Analysis of Accuracy score revealed that (n=26) websites had a score of zero, while (n=9) websites scored 72.72%, (n=1) website scored 31.81%, (n=1) website scored 18.18% and (n=1) website scored 4.54%, (n=2) websites scored 36.36%. 82.5% (n = 33)

of the websites contained an analysis of awarding body content for accuracy. The transparency criteria were tested based on authorship, attribution, currency, disclosure, complementarity, and kitemarks. Overall, 70% (n=28) of sample websites indicated transparency greater than 70%.

95% (n=38) of the sample of 40 websites provided information on authorship. About 97.5% (n=39) of the websites have 100% attribution. About 23% (n=9) of the websites have 100% currency. The result shows websites disclosure scores, which ranged 0.787% – 4.724%. Complementarity and request for advice regarding CVD concerns the total of (n=19) websites 48% of the (n=40) websites scored 100% for full complementarity transparency. The result shows websites kitemarks (Awards) with a range (0.000% – 3.356). Further, HONcode certifications were not found on the Saudi Arabian websites. The average readability score was 83.14 points using the FER scale (Microsoft Office, 2016). The readability result indicates that this sample's average website text level is “easy”. The FKG level for measuring readability showed the mean grade-level score was 3.05, which is interpreted as “Extremely difficult to read. Best understood by university graduates”. Results showed that 100% (n=40) of the websites have a good navigability character with a value of 2 for each website.

Moreover, descriptive and inferential statistical tests were conducted. Mean values indicated that Navigability had the highest mean value, followed by Transparency and Accuracy. However, a standard deviation of zero for Navigability suggested that all websites had the same rating score. However, a lower standard deviation of Transparency indicated that it was rated close to mean value for all websites compared to Accuracy. Besides, Question No 18, 22, 23, 24 and 26 had the highest mean rating while Question No 29 and 30 had the lowest mean response. Correlation analysis depicted a strong positive correlation between authorship and attribution. Also, a

moderate positive correlation was seen between characteristics and complementarity, where all other quality items indicated either small or no correlation. Besides, Kendall's Coefficient of Concordance was measured, and it was observed that there existed a firm agreement on the rating website quality items. Moreover, navigability was rated highest by the respondents compared to other things, while Complementarity was ranked the lowest. Additionally, the Kruskal-Wallis test was also conducted, but no statistically significant difference in the readability of website groups could be determined. The next chapter discusses these findings in relation to existing research and health promotion theories, policies, and practice.

CHAPTER 5 DISCUSSION

5.0 Introduction

This chapter has discussed the study's findings regarding health promotion theories. It critically analyses research on cardiovascular disease (CVD), the researcher's views, the Health Belief Model (HBM), Mass Media and Health Promotion theory. As previously stated, this study assessed the quality of Saudi Arabian websites that disseminate health information about CVD. The websites were evaluated against critical characteristics such as their accuracy, transparency, readability, and navigability. These elements were scored according to the nature of the CVD information disseminated via the evaluated websites to determine whether the information provided on the internet via online consumer health websites about the CVD is accurate and transparent, along with easy to read and navigate, which means it provides a valuable health promotion/educational tool/resource for users. Transparency was assessed against the HON Foundation (2020) code of practice. Readability was tested using the tools available within Microsoft Office (2016), namely, the (FRE) scale and the (FKG) level test. Finally, navigability was tested via the Sandvik (1999) criteria, which examines how easily information can be found within each website by following links from the homepage. The result of this study is similar to previous studies such as (Tahir et al., 2020; Ayyaswami et al., 2019, Leung & Riordain & Porter, 2020).

5.1 Health Belief Model (HBM)

The HBM was established and developed by social scientists at the Public Health Service of the United States in the 1950s to help describe why individuals do not accept disease avoidance techniques or screening tools for early illness diagnosis (Rollins et al., 2018). HBM is one of the best-known models for explaining health-related decision making. HBM highlights that decision

making depends on whether a person thinks a specific means will likely result in achieving the desired end (Naidoo & Wills, 2009). This is logical because rational persons would not look to prevent an unpleasant outcome that they did not feel likely to happen (Naidoo & Wills, 2009).

However, HBM was subsequently adapted by others like Becker (1974) (Naidoo & Wills, 2009). Later applications of the HBM included monitoring patients' responses to symptoms and adherence to medical treatments (Elder et al., 1999). Furthermore, HBM suggests that behavioural beliefs and moderating factors significantly influence behaviour. This is apparent when a patient is susceptible to CVD (perceived susceptibility) and is aware of the threat this sickness poses to their health (perceived severity) also understands the benefits of screening procedures (perceived usefulness) versus the barriers to screening methods (perceived barriers) (Janz & Becker, 1984). The six significant beliefs that HBM identifies are:

- belief in personal susceptibility to an adverse event.
- belief that the event is severe.
- belief that the recommended preventative measure will effectively reduce the threat of the adverse event.
- belief that the recommended measure will not entail too high a cost.
- cues to action.
- health motivation (Naidoo & Wills, 2009), see figure 44.

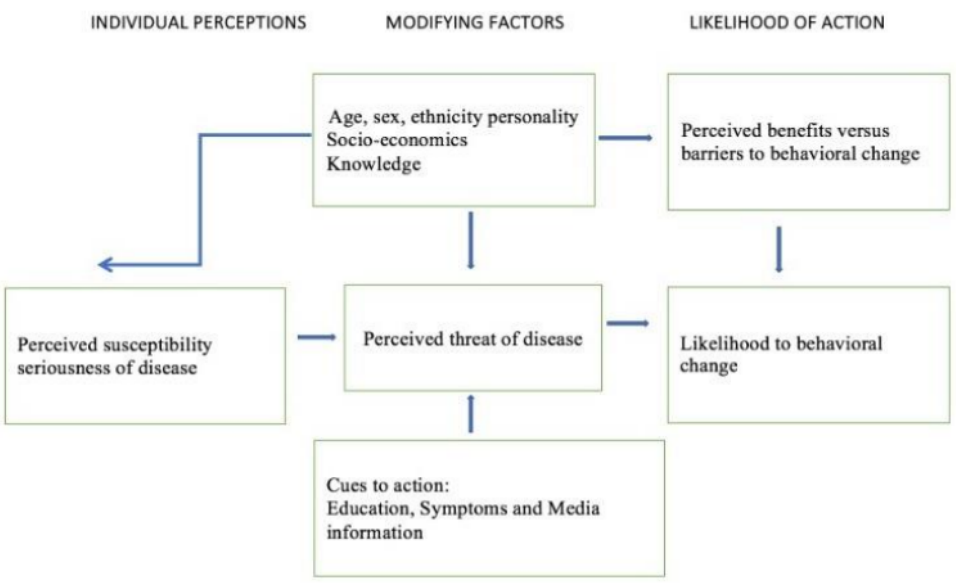


Figure 44: The Health Belief Model (Becker, 1974, 1988; Janz & Becker, 1984)

Further, (Connor & Norman, 2015) highlighted that each person's action cues and motivation for good health have been triggered through many factors. These triggers may be internal, like a physical disease, or external, as with mass media campaigns or peer counselling (Rosenstock, 1988; Becker, 1974; Naidoo & Wills, 2009). Meanwhile, Naidoo and Wills (2009) note that this is a social psychological health behavioural model, which advocates and envisages health-related behaviour regarding to accessing health services. To this end, it demonstrates that persons change their behaviours relative to their perceived susceptibility to health issues, along with the severity of the problem (Naidoo & Wills, 2009). Health promoters look to enhance health. In the specific case of this research on CVD prevention, health information must improve awareness regarding the importance of CVD prevention behaviour. Moreover, it must also trigger behavioural change and improve health motivation. Without raising awareness, people cannot correctly evaluate the risks of CVD and, in turn, less likely to pursue recommended preventative health action.

5.2 Mass Media and Health Promotion Theory

The media has an important influence on public health awareness and attitudes. Information provided via media channels can enhance individual and collective knowledge, change behaviours and lifestyles, and social norms, thus resulting in positive public health outcomes. Research shows, for instance, that women need to be exposed to media – whether via TV, radio, or print – Once a week at least to access information that can lead them to adopt practices for maternal and family health based on evidence (Gashu et al., 2021). It has also been found that most persons who search for health information regarding themselves want to use this information to consult with medical professionals (Sonke et al., 2017). Research also suggests that, across a range of measures such as convenience, emotional support, cost-effectiveness and in-depth information, patients/users rate online support groups as more helpful than physicians (Grandinetti, 2000).

In the Kingdom of Saudi Arabia, almost four-fifths of people report that they accessed information regarding a health condition online, with the most common medical site accessed that of the Saudi (MOH). "The most common subjects that users sought information on were: disease symptoms (76.9%), side effects (70.9%), specific treatments (69.7%), and diagnosis of health conditions (61%). 40.1% of respondents had a medical consultation with a doctor online, with most (67.8%) saying they trusted online physicians in Kingdom of Saudi Arabia" (AlMuammar et al., 2021). See appendix F for a screenshot taken of the Saudi (MOH) website.

5.3 Website Characteristics

Initial analysis of the study sample confirmed the website characteristics: the domain name, source of website, country of origin, users' registration or forum discussion, and links to other social media platforms. The researcher felt it important to identify the characteristics of the websites within the study to establish a correlation between the study variables and the website country of

origin source, along with the additional services the website offered in terms of allowing registration and links to other social media. The website's country of origin was restricted to just one country. The website sample search did not place any restrictions on country or source, just that websites were in the English language. The government of origin for all the 40 selected websites was the Kingdom of Saudi Arabia.

5.4 Accuracy

According to Leung et al. (2020), the HON code seal signifies that the content is of sufficient quality and reliability to users. This is important, as materials can be well-written and thus superficially plausible, yet nevertheless contain biased or inaccurate information. As Ayyaswami et al. (2019) note, readability does not necessarily correlate with the factual accuracy of materials. According to Siddiqui et al. (2020), though a website may be easy to read, it is essential to evaluate the accuracy of the material it contains to ensure users are not being intentionally or unintentionally misinformed.

Furthermore, 8 questions were administered to test the accuracy of the information provided by the 40 selected websites. The maximum possible score was 22. Analysis of Accuracy score revealed that (n=26) websites had a score of zero, while (n=9) websites scored 72.72%, (n=1) website scored 31.81%, (n=1) website scored 18.18% and (n=1) website scored 4.54%, (n=2) websites scored 36.36%. Further analysis revealed that MOH, SSFCM MOHNews, WHO, SBCC, Siemens Healthineers, ANDALUSIAHJH, ASTERSANADHOSPITAL and GNP were the websites with the highest accuracy score. Also, 82.5% (n = 33) of the websites contained an analysis of awarding body content for accuracy, while 17.5% (n = 7) of the websites did not.

Further, the Fishers Exact Test was thus used. This gave a value of 69.100, $p = 0.002$. As (p-value p) is below the significance level ($\alpha = 0.05$), there is a statistically significant correlation between

the website source and the accuracy of the provided information. Moreover, the low mean value of Accuracy with a high standard deviation suggested that the accuracy was rated low and wider. Besides, Kendall's Coefficient of Concordance was determined, and it was observed that there existed a strong agreement on the rating website quality items. Also, Cronbach's Alpha test for the overall questionnaire construct (except first three questions) was calculated to be 0.827, suggesting that that test measure is highly reliable. Moreover, Cronbach's alpha test confirmed that the accuracy measure used in this study appears to have a good level of internal consistency, where it scored 0.986. Similarly, the transparency scale scored 0.699, indicating a sufficient level of internal consistency.

5.5 Transparency

Transparency measures were used to categorise the 40 selected websites, which were checked by reference to the Health Code of the Net Base (HON, 2020), were considered to assess the transparency of the information the 40 websites provided. These were authorship, attribution, currency, disclosure, complementarity, and kitemarks. The HON code principles were employed to develop 24 questions, with a maximum score of 38. The transparency questions thus analysed the websites based on authorship, attribution, currency, disclosure, complementarity, and kitemarks.

Siemens Healthiness website in the sample is the least transparent website, with a score of 42.10% for the transparency of the medical information supplied, while MOHNews indicated 81.57% transparency. Overall, 70% (n=28) of sample websites indicated transparency more significant than 70%. 95% (n=38) of the sample of 40 websites provided information on authorship. 97.5% (n=39) of website authors were healthcare professionals or experts. Also, 90% (n=36) of the websites provide author contact details.

About 97.5% (n=39) of the websites have 100% attribution. Also, the results show that 100%(n=40) of websites included information source clearness, reference available, and include opinions and were awarded a maximum score of 2 for each. 97.5% (n=39) of the websites have external links to scientific reference material/studies. The results show that websites disclosure shad a range of 0.787% – 4.724%. About 23% (n=9) of the websites have 100% currency. Data analysis shows that 100% (n=40) of the websites give the date type, date of the last update and websites updated in the last 4 months and were awarded a maximum score of 2 for each. Regarding complementarity and request for advice regarding CVD, 19 websites (48%) of the 40 websites scored 100% for full complementarity transparency. A higher mean value and lower standard deviation of Transparency compared to accuracy suggested that it was rated close to the mean value for all websites. Besides, Question No 18, 22, 23, 24 and 26 had the highest mean rating while Question No 29 and 30 had the lowest mean response.

In contrast with this result, many Saudi-based websites have poor transparency according to the literature. This presents a significant obstacle in respect provision of quality CVD information online. For example, many Saudi-based websites do not attribute the content's authors. However, with respect to medical websites, this is an essential factor that helps users determine the credibility of the provided information (Marar et al., 2019).

No websites had HON certification. HON (2020) certification emphasises six principles: (a) quality, (b) confidentiality, (c) neutrality, (d) trust, (e) support, and (f) community. Regarding quality, HON regularly inspects health information-disseminating websites, with medical experts tasked to ensure they provide reliable information for users. The HON foundation (2020) also supports website administrators at different phases of the accreditation process. The ultimate goal of HON code certification is to ensure users can access reliable health information online, no

matter where in the world they are located. Furthermore, certification helps web administrators to meet data privacy requirements, thereby protecting users' confidentiality. HON also emphasises autonomy, in that it engages non-governmental and non-profit actors in accrediting databases involved in the provision of health information. Trust is another important element of HON code certification, which encourages website owners to enhance user confidence by adhering to ethical considerations and being objective, transparent, and providing quality information.

5.6 Readability

According to Kher et al. (2017), readability relates to the ease that a reader can understand written content. Low readability can have a negative influence on comprehension (Diviani et al., 2015). The research of Kher et al. (2017) found 196 articles had an average value of 10.9 (SD = 1.8) reading level grade. 99.5% were above the Fifth- to sixth-grade level the AMA recommends, while the FRE test found the articles had a "fairly difficult" readability level (M = 52.3, SD = 12.1 of 100) (Ayyaswami et al., 2019).

By contrast, in this study, readability was tested using tools available in Microsoft Office (2016). Namely, the FRE score and the FKG level score. The average readability score was 83.14 points using the FRE scale (Microsoft Office, 2016). The readability result indicates that the intermediate website text level within the sample is "easy". The study sample ranged from website 21, DSFH, which had a reading level of 19.4, to website 28, KFAFH, which had a reading level of 118. The FKG measure found the mean grade-level score to be 3.05. This is classified as: "Extremely difficult to read. Best understood by university graduates".

5.7 Navigability

The ease that a user can navigate a website has a strong impact on their experience and ability to find the desired information conveniently (Lee et al., 2012). Inability to successfully navigate a

website is considered a barrier to preventative action under the HBM (Rosenstock et al., 1988). Navigability was assessed with respect the study sample by identifying the ease with which information could be found on each website, by following links from the website homepages (Sandvik,1999).

For this study, all 40 websites analysed were found to have very good navigability to navigate and find information related to CVD. Therefore, the results indicate that 100% (n=40) of the selected websites have a navigability character score of 2. Moreover, navigability was rated highest by the respondents compared to other items, while Complementarity was ranked the lowest. It was evident with a mean score of 2 and a zero standard deviation that suggested that navigability of all websites received the same score of 2.

5.8 Summary

This study examined the characteristics, accuracy, transparency, readability, and navigability of Saudi Arabian websites containing CVD-related health information. The data collected and analysed showed that the 40 selected websites significantly differ in accuracy, transparency, navigability and readability. Websites with a .com domain were the most common (n=12) and comprised around 30% of the sample. These were followed by the websites with a. med domain (n=11) around 27.5%. The data also indicated that health professionals were the most frequent source for the information the websites presented, totalling around 43% (n=17) of the sample. Next was government sources, at 35% (n=14). Charity (n=4) and commercial websites(n=4) at 10% for each. Moreover, 40% (n=16) of the websites provide additional assistance for users, with 62.5% (n=25) of websites in the sample do not provide online discussion. Analysis of Accuracy score revealed that (n=26) websites had a score of zero, while (n=9) websites scored 72.72%, (n=1) website scored 31.81%, (n=1) website scored 18.18% and (n=1) website scored 4.54%, (n=2)

websites scored 36.36%. Further analysis revealed that MOH, SSFCM MOHNews, WHO, SBCC, Siemens Healthineers, ANDALUSIAHJH, ASTERSANADHOSPITAL and GNP were the websites with the highest accuracy score. Also, 82.5% (n = 33) of the websites contained an analysis of awarding body content for accuracy.

The transparency criteria considered authorship, attribution, currency, disclosure, complementarity, and kitemarks. The Siemens Healthiness website in the sample is the least transparent website, with a score of 42.10% for the transparency of the medical information supplied, while MOHNews indicated 81.57% transparency. Overall, 70% (n=28) of sample websites indicated transparency greater than 70%. 95% (n=38) of the sample websites declared authorship and 97.5% (n=39) provided external links to scientific reference material/studies. About 97.5% (n=39) of the websites have 100% attribution. About 23% (n=9) of the websites have 100% currency. The disclosure scores of the selected websites ranged from 0.787% – 4.724%. The ALAHSAHOSPITAL website had the highest score, with 4.724%, while the CAR and BHG websites had the lowest, with 0.787%. The result shows Websites Kitemarks (Awards) with range (0.000% – 3.356).

Complementarity and request for advice regarding CVD, the result shows that 48% (n=19) of the websites requested advice regarding CVD. None of the websites had HON code certification. The average readability score was 83.14 points using the FERS scale (Microsoft Office, 2016). The readability results highlight the average text level of the sampled websites is “easy”. The FKG tool for measuring readability showed the mean grade-level score to be 3.05, which is classified as “Extremely difficult to read. Best understood by university graduates”. Results showed that 100% (n=40) of the websites had a navigability value of 2 for each website. The next chapter will summarise the results and discuss some of the study limitations.

CHAPTER 6 CONCLUSION

6.0 Introduction

The research process, and study's results are summarised in this chapter. In addition, the study's limitations. Several suggestions and recommendations for further studies are also outlined.

6.1 Summary of main findings

The analysis illustrated the websites varied regarding to their accuracy, transparency, navigability, and readability. Some of the key findings are as follows:

- The data shows that .com domain websites were the most frequent (n=12), amounting to 30% of the total sample. These were followed by the websites with a. med domain (n=11), amounting to 27.5%.
- The websites were divided into five main groups in terms of administration or sources: Commercial, health professionals, government, charity, and others. Most of the information in the sample came from health professionals, making up around 43% of the total (n=17). These were followed by the government, with 35% (n=14). Charity (n=4) and commercial websites (n=4) at 10% (n=4) for each.
- About 62.5% (n=25) of the sampled websites do not offer online discussion, while 37.5% (n=15) provide it. Moreover, 60% (n=24) of the websites does not provide users extra assistance, while 40% (n=16) do. Of the 40 websites, about 97.5% (n=39) do not require the user first to register an account.
- All websites (n=40) 100% contained links to social media platforms like WhatsApp®, Facebook®, YouTube® and Twitter®.
- Regarding the analysis of accuracy score revealed that 26 websites had a score of zero, while 9 websites scored 72.72%, one website scored 31.81%, one website scored 18.18%,

one website scored 4.54% and two websites scored 36.36%. Further analysis revealed that MOH, SSFCM MOHNews, WHO, SBCC, Siemens Healthineers, ANDALUSIAHJH, ASTERSANADHOSPITAL and GNP were the websites with the highest accuracy score. 82.5% (n = 33) of the websites contained an analysis of awarding body content for accuracy.

- About 28% (n=11) of the websites touched on the definition of CVD. About 25% (n = 10) of the websites offered information about CVD aetiology.
- About 25% (n=10) mentioned CVD risk factors, one website partially covered while remaining websites were silent. Moreover, about 25% (n=10) of the websites were awarded a maximum score of 2 with respect to the complications of CVD.
- About 32.5% (n=13) of the websites mentioned prevalence of CVD, while 67.5% (n=27) websites did not provide any information. About 27.5% (n=11) provided full information on diagnosis.
- About 25% (n=10) of websites gave comprehensive information on CVD symptoms; one website provided some information while others were silent.
- About 30% (n=12) mentioned CVD treatment through early disease recognition. 92% (n=11) provided complete information and were awarded a maximum score of 2.
- The transparency criteria considered authorship, attribution, currency, disclosure, complementarity, and kitemarks. The Siemens Healthiness website in the sample is the least transparent website, with a score of 42.10% for the transparency of the medical information supplied, while MOHNews indicated 81.57% transparency. Overall, 70% (n=28) of sample websites indicated transparency more significant than 70%.

- 95% (n=38) of 40 websites had details regarding authorship. Around 98% (n=39) provided author credentials, only 2% (n=1) did not. 97.5% (n=39) of website authors were a healthcare professional or expert. 100% (n=40) of websites had verifiable credentials and therefore received a maximum score of 2. 90% (n=36) also provided author contact details.
- About 97.5% (n=39) of the websites had full attribution, while 2.5% (n=1) of websites had about 86%. Also, 100%(n=40) of websites include information source clearness, reference available, and opinions and were awarded a maximum score of 2 for each. 97.5% (n=39) of the websites have external links to scientific reference material/studies.
- Around 23% (n=9) of the websites had 100% currency. The KFSHRC and ESC websites that is 50% of currency. The ALAHSAHOSPITAL website had about 43.5% of currency, the KAMC website has 25%, while the AHA website had about 6.25%.
- Regarding disclosure, the ALAHSAHOSPITAL website had the highest score, at 4.724%, while the CAR and BHG websites had the lowest scores, with 0.787%.
- (n=19) websites that is 48% of the sample, scored 100% for full complementarity transparency. However, (n=21) websites 52% of the sample, did not.
- None of the Saudi websites had HON code certification. About 68% (n=28) of websites have 100% of kitemarks/awards, while 15% (n=6) of websites have 0% of kitemarks/awards. MOHNews and KFSHRC website have 80% of kitemarks/awards, KAMC and DASH websites have 40%, while WHO website and SiemensHealthineers website have 20% of kitemarks/awards.
- Regarding the readability, the study sample ranged from website 21, DSFH, which had a reading level of 19.4, to website 28, KFAFH, which scored 118. The mean reading score for the 40 sampled websites was 83.14. FRE recommends texts fall between a score of 80

and 90. Meanwhile, the mean grade-level score was 3.05, meaning the sample on average did not meet the recommended level. The study sample ranged from website 28, KFAFH, which had a grade level of -2.3, to website 31, KFMC, which had a level of 11.3.

- Regarding navigability, all the websites had links which could be easily found from the homepage. 100% (n=40) of the selected websites therefore achieved a navigability score of 2.
- The Fishers Exact Test was used. This gave a value of 69.100, $p = 0.002$. As (p-value p) is below the significance level ($\alpha = 0.05$), there is a statistically significant correlation between the website source and the accuracy of the content. In addition, reliability was confirmed by a Cronbach's alpha test. Results from SPSS revealed Cronbach Alpha value of 0.986 and 0.699 for Accuracy and Transparency respectively suggesting high reliability of our tests, which also indicates a sufficient level of internal consistency.

6.2 Limitations of the study

Some limitations impact the study. First, as the country of interest was Kingdom of Saudi Arabia, the researcher had to ensure the materials analysed were taken from websites and not published databases. Second, applying a purposive sampling strategy, though justified, limited the website sample, with the total study sample of 40 websites is not huge. Third, the recommended reading level is based on persons whose first language is English. Applying such frameworks to persons whose native tongue is another language to English should therefore be viewed as another potential limitation. Finally, some literature review found only limited studies concerning OHI regarding CVD. All these limitations have impacted on the ability to generalise the study findings.

6.3 Summary

The study evaluated information presented on 40 websites regarding CVD. The assessment has

considered the accuracy, readability, navigability, and transparency of the provided content, with all findings thereafter presented. The limitations of this study have also been considered. The study's findings show that the Saudi Arabian health administrations that offer data related to CVD on their websites in English must be improve their sites. Further investigation is however required to understand in depth what challenges prevent delivery of high-quality, reliable information about CVD, along with how this content then influences consumers' health and trust. Increasingly, the internet is accessible to people and online search for information's health either to diagnose themselves or to supplement what they have learnt from health professionals before then seeking further advice. This study can be beneficial to health promoters and health professionals in Kingdom of Saudi Arabia, as it presents the used data to develop interventions to increase awareness of the use of reliable and credible OHI.

6.4 Implications for Future Policy and Practice, Health Promotion Opportunities and Further Research

The following recommendations are suggested:

- Health care professionals, Saudi Arabian government bodies, and health promotion organisations that provide CVD information on their websites, must have up-to-date knowledge of the websites to ensure they provide content of the highest standard to significantly improve website accuracy, transparency, and readability for advising patients appropriately as to where they can find additional information and CVD advice online.
- Health platforms by health professionals should regularly assess their website's ranking on search engines to ensure the site remains easily accessible for users.
- During the COVID-19 pandemic, many services moved online. Therefore, it is

important to ensure that websites are accurate now more than ever before ,reliable, credible, and straightforward to read and navigate, so that readers can find the information they desire. Improvements are needed to enhance user experiences, as well as to encourage testing and treatment.

- Web designers who they are providing online CVD screening websites should ensure they provide accurate and comprehensive health information. Moreover, there should be opportunities for website users to be involved in the design and development of CVD-related online resources. This will help the websites to meet user needs more effectively.
- Campaigns should be adopted to enhance awareness of the need for users to verify information provided on websites to avoid inaccuracies, to better assess the level of awareness of health promotion initiatives regarding preventative or health self-care services.
- Health policymakers in Saudi Arabia should establish a specific recommended level of readability for non-English speaking readers.
- Legislation should be introduced to make health information websites to comply with the WHO guidelines, the HON code, and CVD codes. Furthermore, restrictions should be placed on websites that do not update content when necessary. And the design of the websites should also meet the requirements of the (JAMA) criteria. Saudi Arabia should prioritise working with HON or similar organisations to ensure only properly accredited health information is provided. Health sites must obtain a pre-approved HON certificate.
- Public health organizations like the WHO and Saudi (MOH) needs to publish a

list of websites that provide accurate content regarding CVD in various languages.

7. REFERENCES

Al-Anezi, F. M. (2021). Evaluating the readiness of mobile technology with respect to e-heath for medication in Saudi Arabia: An integrative perspective. *Journal of Multidisciplinary Healthcare*, *Volume 14*, 59–66. https://doi.org/10.2147/jmdh.s287321

Al-Khashan, H., Almulla, N., Galil, SiddigA. A., Rabbulnabi, A., & Mishriky, A. (2012). Gender differences in health education needs and preferences of Saudis attending Riyadh Military Hospital in the Kingdom of Saudi Arabia. *Journal of Family and Community Medicine*, *19*(3), 172. https://doi.org/10.4103/2230-8229.102317

Alanzi, T., & Al-Yami, S. (2019). Physicians' attitude towards the use of social media for professional purposes in Saudi Arabia. *International Journal of Telemedicine and Applications*, *2019*, 1–6. https://doi.org/10.1155/2019/6323962

Aldabbagh, D., Alsharif, K., & Househ, M. S. (2013, January). Health information in the Arab world. In ICIMTH (pp. 297-299). Doi: 10.3233/978-1-61499-276-9-297.

Alhabib, K. F., Batais, M. A., Almigbal, T. H., Alshamiri, M. Q., Altaradi, H., Rangarajan, S., & Yusuf, S. (2020). Demographic, behavioral, and cardiovascular disease risk factors in the Saudi population: results from the Prospective Urban Rural Epidemiology study (PURE-Saudi). *BMC Public Health*, *20*(1). https://doi.org/10.1186/s12889-020-09298-w

Almansour, H. A., Aloudah, N. M., Alhawassi, T. M., Chaar, B., Krass, I., & Saini, B. (2020). Health consumer engagement in developing novel preventive health community pharmacy roles in cardiovascular disease in Saudi Arabia: A qualitative analysis. *Saudi Pharmaceutical Journal*, *28*(5), 529–537. https://doi.org/10.1016/j.jsps.2020.03.004

Almansour, H. A., Mekonnen, A. B., Aloudah, N. M., Alhawassi, T. M., Mc Namara, K., Chaar, B., Krass, I., & Saini, B. (2020). Cardiovascular disease risk screening by pharmacists: a

behavior change wheel guided qualitative analysis. *Research in Social and Administrative Pharmacy*, *16*(2), 149–159.https://doi.org/10.1016/j.sapharm.2019.04.009

AlMuammar, S. A., Noorsaeed, A. S., Alafif, R. A., Kamal, Y. F., & Daghistani, G. M. (2021). The use of internet and social media for health information and its consequences among the population in Saudi Arabia. *Cureus*. https://doi.org/10.7759/cureus.18338

Alshaikh, M. K., Filippidis, F. T., Baldove, J. P., Majeed, A., & Rawaf, S. (2016). Women in Saudi Arabia and the prevalence of cardiovascular risk factors: A systematic review. *Journal of Environmental and Public Health*, *2016*, 1–15. https://doi.org/10.1155/2016/7479357

Alshehri, A., Alghofaili, N., ALshunaiber, R., & Alkadi, L. (2021). Quality and readability assessment of internet-based information on common prosthodontic treatments. *The International Journal of Prosthodontics*. https://doi.org/10.11607/ijp.7063

American Heart Association. (2021, January 27). Heart disease #1 cause of death rank likely to be impacted by COVID-19 for years to come. American Heart Association. https://newsroom.heart.org/news/heart-disease.

Amirah, M. A., Nada, M. A., Anna, A., Mowafa, S. H., & Ashraf, E. (2015). The epidemiology of congenital heart diseases in Saudi Arabia: A systematic review. *Journal of Public Health and Epidemiology*, *7*(7), 232–240. https://doi.org/10.5897/jphe2015.0723

Ananya Mandal. (2019, May 31). Cardiovascular disease diagnosis. News-Medical.net. https://www.news-medical.net/health/Cardiovascular-Disease-Diagnosis.aspx.

Arsenault, M., Blouin, M. J., & Guitton, M. J. (2016). Information quality and dynamics of patients' interactions on tonsillectomy web resources. *Internet Interventions*, *4*, 99–104. https://doi.org/10.1016/j.invent.2016.05.002

Arslan, D., Sami Tutar, M., Kozanhan, B., & Bagci, Z. (2019). The quality, understandability, readability, and popularity of online educational materials for heart murmur. *Cardiology in the Young*, 1–9. https://doi.org/10.1017/s104795111900307x

Ayyaswami, V., Padmanabhan, D., Patel, M., Prabhu, A. V., Hansberry, D. R., Agarwal, N., & Magnani, J. W. (2019). A readability analysis of online cardiovascular disease-related health education materials. *HLRP: Health Literacy Research and Practice*, *3*(2), e75–e80. https://doi.org/10.3928/24748307-20190306-03

Backer, G. D. (2017). Prevention of cardiovascular disease: recent achievements and remaining challeng. Escardio.org. https://www.escardio.org/Journals/E-Journal-of-Cardiology-Practice/Volume-15/prevention-of-cardiovascular-disease-recent-achievements-and-remaining-challeng.

Cajita, M. I., Rodney, T., Xu, J., Hladek, M., & Han, H.-R. (2017). Quality and health literacy demand of online heart failure information. *Journal of Cardiovascular Nursing*, *32*(2), 156–164. https://doi.org/10.1097/jcn.0000000000000324

CASP. (2018). *CASP checklists*. CASP - Critical Appraisal Skills Programme. https://casp-uk.net/casp-tools-checklists/

Chang, K. L., Grubbs, E. G., & Ingledew, P.-A. (2019). An analysis of the quality of thyroid cancer websites. *Endocrine Practice*, *25*(10), 1003–1011. https://doi.org/10.4158/ep-2018-0595

Clarke, M. A., Belden, J. L., Koopman, R. J., Steege, L. M., Moore, J. L., Canfield, S. M., & Kim, M. S. (2013). Information needs and information-seeking behaviour analysis of primary care physicians and nurses: a literature review. *Health Information & Libraries Journal*, *30*(3), 178–190. https://doi.org/10.1111/hir.12036

Cleveland Clinic (2021) Cardiovascular Disease. [Online] Available from: https://my.clevelandclinic.org/health/diseases/21493-cardiovascular-disease.

Conner, M. (2010). Cognitive Determinants of Health Behavior. *Handbook of Behavioral Medicine*, 19–30. https://doi.org/10.1007/978-0-387-09488-5_2

Conner, M., & Norman, P. (2015). EBOOK: Predicting and Changing Health Behaviour: Research and Practice with Social Cognition Models. In *Google Books*. McGraw-Hill Education (UK). https://books.google.com.sa/books?hl=ar&lr=&id=pMkvEAAAQBAJ&oi=fnd&pg=PA1&dq=Connor.+M.

Daraz, L., Morrow, A. S., Ponce, O. J., Farah, W., Katabi, A., Majzoub, A., Seisa, M. O., Benkhadra, R., Alsawas, M., Larry, P., & Murad, M. H. (2018). Readability of online health information: A meta-narrative systematic review. *American Journal of Medical Quality*, *33*(5), 487–492. https://doi.org/10.1177/1062860617751639

De Bock, F., & Spura, A. (2021). Evidenzbasierung: Theoriebildung und praktische Umsetzung in Prävention und Gesundheitsförderung. *Bundesgesundheitsblatt - Gesundheitsforschung - Gesundheitsschutz*, *64*(5), 511–513. https://doi.org/10.1007/s00103-021-03325-w

DeNicola, E., Aburizaiza, O. S., Siddique, A., Khwaja, H., & Carpenter, D. O. (2015). Obesity and public health in the Kingdom of Saudi Arabia. *Reviews on Environmental Health*, *30*(3), 191-205. https://doi.org/10.1515/reveh-2015-0008

Diviani, N., van den Putte, B., Giani, S., & van Weert, J. C. (2015). Low health literacy and evaluation of online health information: A Systematic review of the literature. *Journal of Medical Internet Research*, *17*(5), e112. https://doi.org/10.2196/jmir.4018

Elder, J. P., Ayala, G. X., & Harris, S. (1999). Theories and intervention approaches to health-behavior change in primary care. *American Journal of Preventive Medicine*, *17*(4), 275–284. https://doi.org/10.1016/s0749-3797(99)00094-x

England, C. Y., & Nicholls, A. M. (2004). Advice available on the Internet for people with coeliac disease: an evaluation of the quality of websites. *Journal of Human Nutrition and Dietetics: The Official Journal of the British Dietetic Association*, *17*(6), 547–559. https://doi.org/10.1111/j.1365-277X.2004.00561.x

Everson-Rose, S. A., & Lewis, T. T. (2005). Psychosocial factors and cardiovascular diseases. *Annual Review of Public Health*, *26*(1), 469–500. https://doi.org/10.1146/annurev.publhealth.26.021304.144542

Felman, A. (2021, July 26). *Cardiovascular disease: Types, symptoms, prevention, and causes*. https://www.medicalnewstoday.com/articles/257484

Finfgeld, D. L., Wongvatunyu, S., Conn, V. S., Grando, V. T., & Russell, C. L. (2003). Health Belief Model and Reversal Theory: a comparative analysis. *Journal of Advanced Nursing*, *43*(3), 288–297. https://doi.org/10.1046/j.1365-2648.2003.02712.x

Gashu, K. D., Yismaw, A. E., Gessesse, D. N., & Yismaw, Y. E. (2021). Factors associated with women's exposure to mass media for Health Care Information in Ethiopia. A case-control study. *Clinical Epidemiology and Global Health*, *12*, 100833. https://doi.org/10.1016/j.cegh.2021.100833

Grandinetti, D. A. (2000). Doctors and the Web. Help your patients surf the Net safely. *Medical Economics*, *77*(5), 186–188, 194–196, 201. https://pubmed.ncbi.nlm.nih.gov/10848409/

Grønmo, S. (2019). Social research methods: Qualitative, quantitative and mixed methods approaches. Sage. ISBN-13: 978-1526441249.

Gutierrez, J., Alloubani, A., Mari, M., & Alzaatreh, M. (2018). Cardiovascular Disease Risk Factors: Hypertension, Diabetes Mellitus and Obesity among Tabuk Citizens in Saudi Arabia. *The Open Cardiovascular Medicine Journal*, *12*,41. https://dx.doi.org/10.2174%2F1874192401812010041

Health on the Net (HON). (2020). *Social networks*. Health on the Net. https://www.hon.ch/en/certification/social-networks.html

Higgins, C., Tang, S., & Stubbs, W. (2019). On managing hypocrisy: The transparency of sustainability reports. *Journal of Business Research*, 114, 395–407. https://doi.org/10.1016/j.jbusres.2019.08.041

HON. (2020). Health on the net Foundation.From Health on the net code principles: https://www.hon.ch/HONcode/Visitor/visitor.html.

IBM. (2016). SPSS Statistics - Overview. Ibm.com https://www.ibm.com/products/spss-statistics.

Iftikhar, R., & Abaalkhail, B. (2017). Health-seeking influence reflected by online health-related messages received on social media: Cross-Sectional Survey. *Journal of Medical Internet Research*, *19*(11), e382. https://doi.org/10.2196/jmir.5989

Jager, L., Hussein, S., Swanepoel, D., & Mahomed-Asmail, F. (2018). Knowledge and attitudes of early childhood development practitioners towards hearing health in poor communities. *International Journal of Paediatric Otorhinolaryngology*, *106*, 16-20. https://doi.org/10.1016/j.ijporl.2017.12.026

Jahan, S., & Al-Saigul, A. M. (2017). Primary health care research in Saudi Arabia: A quantitative analysis. *International Journal of Health Sciences*, *11*(2), 9–15. https://pubmed.ncbi.nlm.nih.gov/28539857/

Janz, N. K., & Becker, M. H. (1984). The health belief model: A decade later. *Health Education Quarterly*, *11*(1), 1–47. https://doi.org/10.1177/109019818401100101

Kalu, F. A. (2017). What makes qualitative research good research? An exploratory analysis of critical elements. *International Journal of Social Science Research*, *5*(2), 43. https://doi.org/10.5296/ijssr.v5i2.10711

Kapoor, K., George, P., Evans, M. C., Miller, W. J., & Liu, S. S. (2017). Health literacy: readability of ACC/AHA online patient education material. *Cardiology*, *138*(1), 36–40. https://doi.org/10.1159/000475881

Kher, A., Johnson, S., & Griffith, R. (2017). Readability assessment of online patient education material on congestive heart failure. *Advances in Preventive Medicine*, *2017*, 1–8. https://doi.org/10.1155/2017/9780317

Kim, H.-Y. (2017). Statistical notes for clinical researchers: Chi-squared test and Fisher's exact test. *Restorative Dentistry & Endodontics*, *42*(2), 152. https://doi.org/10.5395/rde.2017.42.2.152

KIRTHI, V., & MODI, B. N. (2012). Coronary Angioplasty and the Internet: What Can Patients Searching Online Expect to Find? *Journal of Interventional Cardiology*, *25*(5), 476–481. https://doi.org/10.1111/j.1540-8183.2012.00748.x

Kivunja, C., & Kuyini, A. B. (2017). Understanding and Applying Research Paradigms in Educational Contexts. *International Journal of Higher Education*, *6*(5), 26. https://doi.org/10.5430/ijhe.v6n5p26

Kubis, H.-P., Alshubrami, M., Alrajhi, S., & Cox, W. (2017). Effectiveness of a weight-loss intervention using self-monitoring practice with eating behavioral commandments in obese females, Riyadh, Saudi Arabia. *Saudi Journal of Obesity*, *5*(2), 77.

https://doi.org/10.4103/sjo.sjo_15_17

Lee, J., Lee, D., Moon, J., & Park, M.-C. (2012). Factors affecting the perceived usability of the mobile web portal services: comparing simplicity with consistency. *Information Technology and Management*, *14*(1), 43–57. https://doi.org/10.1007/s10799-012-0143-8

Leung, J.-Y., Ni Riordain, R., & Porter, S. (2020). Readability and quality of online information regarding dental treatment for patients with ischaemic heart disease. *British Dental Journal*, *228*(8), 609–614. https://doi.org/10.1038/s41415-020-1331-2

Levitt, H. M., Bamberg, M., Creswell, J. W., Frost, D. M., Josselson, R., & Suárez-Orozco, C. (2018). Journal article reporting standards for qualitative primary, qualitative meta-analytic, and mixed methods research in psychology: The APA Publications and Communications Board task force report. *American Psychologist*, *73*(1), 26–46. https://doi.org/10.1037/amp0000151

Linney, S. (2017). The Flesch Reading Ease and Flesch-Kincaid Grade Level [Blog]. Retrieved from https://readable.com/blog/the-flesch-reading-ease-and-flesch-kincaid-grade-level/.

Majid, U., & Vanstone, M. (2018). Appraising qualitative research for evidence syntheses: a compendium of quality appraisal tools. *Qualitative Health Research*, *28*(13), 2115–2131. https://doi.org/10.1177/1049732318785358

Malmqvist, J., Hellberg, K., Möllås, G., Rose, R., & Shevlin, M. (2019). Conducting the pilot study: a neglected part of the research process? methodological findings supporting the importance of piloting in qualitative research studies. *International Journal of Qualitative Methods*, *18*, 1–11. https://doi.org/10.1177/1609406919878341

Marar, S., Al-Madaney, M., & Almousawi, F. (2019). Health information on social media. Perceptions, attitudes, and practices of patients and their companions. *Saudi Medical*

Journal, *40*(12), 1294–1299. https://doi.org/10.15537/smj.2019.12.24682

Mayo Clinic. (2021). Heart disease - Symptoms and causes. Mayo Clinic. https://www.mayoclinic.org/diseases-conditions/heart-disease/symptoms-causes/syc-20353118.

Menge, B. A., & Sutherland, J. P. (1976). Species diversity gradients: Synthesis of the roles of predation, competition, and temporal heterogeneity. *The American Naturalist*, *110*(973), 351–369. https://doi.org/10.1086/283073

Microsoft Office. (2016). Microsoft Download Center. https://www.microsoft.com/en-us/download/details.aspx?id=56525.

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: The prisma statement. *PLoS Medicine*, *6*(7), e1000097. https://doi.org/10.1371/journal.pmed.1000097

Münchow, H., Richter, T., von der Mühlen, S., & Schmid, S. (2019). The ability to evaluate arguments in scientific texts: Measurement, cognitive processes, nomological network, and relevance for academic success at the university. *British Journal of Educational Psychology*, *89*(3), 501–523. https://doi.org/10.1111/bjep.12298

Naidoo, J. & Wills, J. (2009) Foundations for Health Promotion (3rd ed) Bailliere Tindall. Elsevier.

NHS (2021) Cardiovascular disease. [Online] Available from: https://www.nhs.uk/conditions/cardiovascular-disease/.

NHS. (2020). Guidelines. Retrieved 3 November 2020 from https://www.guidelines.co.uk/nhs-guideline/1169.type.

NICE. (2020). NICE guidance. Retrieved 7 December 2020 from

https://www.nice.org.uk/guidance.

Nilsen, P. (2020). Making Sense of Implementation Theories, Models, and Frameworks. *Implementation Science 3.0*, 53–79. https://doi.org/10.1007/978-3-030-03874-8_3

Oloidi, A., Nduaguba, S. O., & Obamiro, K. (2020). Assessment of quality and readability of internet-based health information related to commonly prescribed angiotensin receptor blockers. *Pan African Medical Journal*, *35*. https://doi.org/10.11604/pamj.2020.35.70.18237

Osokpo, O., & Riegel, B. (2019). Cultural factors influencing self-care by persons with cardiovascular disease: An integrative review. *International Journal of Nursing Studies*, 103383. https://doi.org/10.1016/j.ijnurstu.2019.06.014

Price, C. (2020, October 2). *14 Great Search Engines You Can Use Instead of Google*. Search Engine Journal; Search Engine Journal. https://www.searchenginejournal.com/alternative-search-engines/271409/#close

Protheroe, J., Estacio, E. V., & Saidy-Khan, S. (2015). Patient information materials in general practices and promotion of health literacy: an observational study of their effectiveness. *British Journal of General Practice*, *65*(632), e192–e197. https://doi.org/10.3399/bjgp15x684013

Rahmad, H., Inggris, T. B., & Ilmiah, K. (2016, June). THE READABILITY OF READING TEXTS ON THE ENGLISH TEXTBOOK. https://www.researchgate.net/publication/311571123

Robert, A. A., & Al Dawish, M. A. (2020). Cardiovascular Disease among Patients with Diabetes: The Current Scenario in Saudi Arabia. *Current Diabetes Reviews*, *16*. https://doi.org/10.2174/1573399816666200527135512

Rodriguez, F., Ngo, S., Baird, G., Balla, S., Miles, R., & Garg, M. (2020). Readability of Online Patient Educational Materials for Coronary Artery Calcium Scans and Implications for Health Disparities. *Journal of the American Heart Association*, *9*(18). https://doi.org/10.1161/jaha.120.017372

Rollins, L., Sy, A., Crowell, N., Rivers, D., Miller, A., Cooper, P., Teague, D., Jackson, C., Henry Akintobi, T., & Ofili, E. (2018). Learning and Action in Community Health: Using the Health Belief Model to Assess and Educate African American Community Residents about Participation in Clinical Research. *International Journal of Environmental Research and Public Health*, *15*(9), 1862. https://doi.org/10.3390/ijerph15091862

Rosenstock, I. M., Strecher, V. J., & Becker, M. H. (1988). Social Learning Theory and the Health Belief Model. *Health Education Quarterly*, *15*(2), 175–183. https://doi.org/10.1177/109019818801500203

Sandvik, H. (1999). Health information and interaction on the internet: a survey of female urinary incontinence. *BMJ*, *319*(7201), 29–32. https://doi.org/10.1136/bmj.319.7201.29

Saquib, N., Zaghloul, M. S., Mazrou, A., & Saquib, J. (2017). Cardiovascular disease research in Saudi Arabia: a bibliometric analysis. *Scientometrics*, *112*(1), 111–140. https://doi.org/10.1007/s11192-017-2393-z

Sbaffi, L., & Rowley, J. (2017). Trust and Credibility in Web-Based Health Information: A Review and Agenda for Future Research. *Journal of Medical Internet Research*, *19*(6), e218. https://doi.org/10.2196/jmir.7579

Shah, S. R., & Al-Bargi, A. (2013). Research Paradigms: Researchers' Worldviews, Theoretical Frameworks and Study Designs. Arab World English Journal, 4(4). (2021). https://s3.us-

west-2.amazonaws.com/us-west-2.files.campus.edublogs.org/sites.gsu.edu/dist/7/3504/files/2016/12/Shah-2013-Research-paradigms-Researchers-worldviews-theoretical-frameworks-and-study-designs-1duh1ty.pdf.

Siddiqui, E., Shah, A., Sambol, J., & Waller, A. H. (2020). Readability Assessment of Online Patient Education Materials on Atrial Fibrillation. *Cureus*. https://doi.org/10.7759/cureus.10397

Smith, T., Fowler-Davis, S., Nancarrow, S., Ariss, S. M. B., & Enderby, P. (2018). Leadership in interprofessional health and social care teams: a literature review. *Leadership in Health Services*, *31*(4), 452–467. https://doi.org/10.1108/lhs-06-2016-0026

Sonke, J., B. Lee, J., Helgemo, M., Rollins, J., Carytsas, F., Imus, S., Lambert, P. D., Mullen, T., Pabst, M., Rosal, M., Spooner, H., & Walsh, I. (2017). Arts in health: considering language from an educational perspective in the United States. *Arts & Health*, *10*(2), 151–164. https://doi.org/10.1080/17533015.2017.1334680

Statcounter Global Stats. (2021). *StatCounter Global Stats - Browser, OS, Search Engine including Mobile Usage Share*. StatCounter Global Stats. https://gs.statcounter.com/

Tahir, M., Usman, M., Muhammad, F., Rehman, S. ur, Khan, I., Idrees, M., Irfan, M., & Glowacz, A. (2020). Evaluation of Quality and Readability of Online Health Information on High Blood Pressure Using DISCERN and Flesch-Kincaid Tools. *Applied Sciences*, *10*(9), 3214. https://doi.org/10.3390/app10093214

The National Health Services (NHS), Department of Health. (2003). *Toolkit for producing patient information*. https://wessexahsn.org.uk/img/projects/NHS%20Toolkit%20for%20producing%20patien

t%20information%20v2%20(2003)-1489154340.pdf

Turk-Adawi, K., Sarrafzadegan, N., Fadhil, I., Taubert, K., Sadeghi, M., Wenger, N. K., Tan, N. S., & Grace, S. L. (2017). Cardiovascular disease in the Eastern Mediterranean region: epidemiology and risk factor burden. *Nature Reviews Cardiology*, *15*(2), 106–119. https://doi.org/10.1038/nrcardio.2017.138

Tyrovolas, S., Bcheraoui, C. E., Alghnam, S. A., Alhabib, K. F., Almadi, M. A. H., Al-Raddadi, R. M., Bedi, N., Tantawi, M. E., Krish, V. S., Memish, Z. A., Mohammad, Y., Molassiotis, A., Panagiotakos, D., Salam, N., Sobaih, B. H., & Mokdad, A. H. (2020). The burden of disease in Saudi Arabia 1990–2017: results from the Global Burden of Disease Study 2017. *The Lancet Planetary Health*, *4*(5), e195–e208. https://doi.org/10.1016/S2542-5196(20)30075-9

Williams, K., Clarke, T., Gardiner, S., Zimmerman, J., & Tomasic, A. (2019). Find and Seek. *ACM Transactions on Accessible Computing*, *12*(3), 1–23. https://doi.org/10.1145/3342282

Wojdynski, B. W., & Kalyanaraman, S. (2015). The three dimensions of website navigability: Explication and effects. *Journal of the Association for Information Science and Technology*, *67*(2), 454–464. https://doi.org/10.1002/asi.23395

World Health Organization, WHO (2021). *Cardiovascular Diseases (CVDs)*. https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds)

World Health Organization, WHO (2017). *Cardiovascular Diseases (CVDs)* Fact Sheet. at: https://www.euro.who.int/en/health-topics/noncommunicable-diseases/cardiovascular-diseases/data-and-statistics

World Health Organization, WHO (2019). *Cardiovascular diseases*. https://www.who.int/health-

topics/cardiovascular-diseases#tab=tab_1.

8. APPENDICE

Legends to the Appendixes

APPENDIX A- CLARE ENGLAND PERMISSION.

APPENDIX B - THE SCREENING TOOL EVALUATING SAMPLE WEBSITES.

APPENDIX C - LIST OF SAUDI WEBSITES SAMPLED.

APPENDIX D - ANALYSIS OF ACCURACY, TRANSPRANCY, READABILITY, TRANSPRANY AND NAVIGABILITY SCORES

APPENDIX E - HONCODE TOOLBAR.

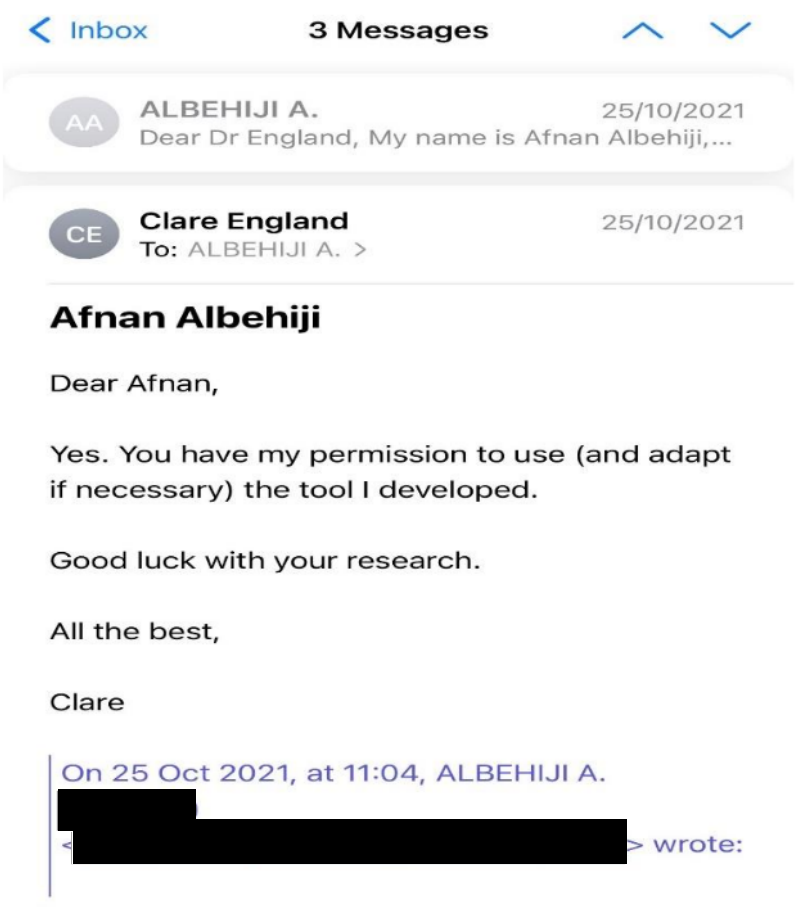
APPENDIX F- WEBSITE SAMPLED.

APPENDIX G- CRONBACH ALPHA IF A QUESTION ITEM IS DELETED.

APPENDIX H- DESCRIPTIVE STATISTICS OF WEBSITE QUALITY ITEMS.

APPENDIX J- CORRELATION ANALYSIS OF WEBSITE QUALITY RATINGS.

8.1 APPENDIX A: CLARE ENGLAND PERMISSION



Inbox 3 Messages

AA ALBEHIJI A. 25/10/2021
Dear Dr England, My name is Afnan Albehiji,...

CE **Clare England** 25/10/2021
To: ALBEHIJI A. >

Afnan Albehiji

Dear Afnan,

Yes. You have my permission to use (and adapt if necessary) the tool I developed.

Good luck with your research.

All the best,

Clare

On 25 Oct 2021, at 11:04, ALBEHIJI A. [redacted] < [redacted] > wrote:

8.2 APPENDIX B: THE SCREENING TOOL EVALUATING SAMPLE WEBSITES

Characteristic of the website sample:

1. What is the top-level domain (TLD) of the selected website?

1. Gov

2. .Com

3. .Org

4. .Net

5. Edu

6. Med

7. Car

8. SA

9. Other

2. What is the website's country of origin the website?

1. Kingdom of Saudi Arabia

3. Who administrates the website/ What is the source of the website?

1. Government

2. Commercial

3. Charity

4. Health platform by health professionals

5. Other

4. Does the website offer the opportunity to register and receive

further information/advice and/or a discussion forum?

0.No

1.Yes

5. Does the website provides additional assistance when required for prevention reasons?

0.No

1.Yes

6.Does the website offer a platform for online discussion?

0.No

1.Yes

7. Does the website provide links to other social media platforms such as Instagram, Twitter, Facebook, etc.?

0.No

1.Yes

ACCURACY, (Total maximum score of 22)

Medical information

7. Definition of Cardiovascular Disease: Cardiovascular Disease (CVD) constitutes a generic classification for a group of disorders which effect the heart or blood vessels. CVD is primarily linked with increases fatty deposits inside the arteries, atherosclerosis, along with highest risk of blood clots (NHS, 2021). The conditions grouped under the CVD label include coronary heart disease, rheumatic heart disease, and cerebrovascular disease, among others (World Health Organization, 2019).

Incorrect = -1

Absent =0

Partially complete =1

Complete=2

8. Aetiology:

- **Environmental stressori:**

i. Serious life upsets such as family deaths.

ii. Significant lifestyle changes like divorce or job loss.

iii. Chronic stress and burnout resulting from work, family or personal problems.

iv. Social media pressures.

- **Biological factors** include inadequate nutrition, along with genetic, hormonal, neurological and neuroendocrinological issues.
- **Co-Occurring disorders** include other medical ailments and psychological issues.

Incorrect = -1

Absent =0

Partially complete=1

Complete=2

9. Prevalence: The American Heart Association (2021) highlights that there were almost 18.6 million deaths worldwide from cardiovascular disease in 2019 (the last year for which these statistics are available). This represents a 17.1% increase in a decade. Furthermore, 523.2 million cases of CVD were recorded in 2019, which is up from 26.6% in 2010 (American Heart Association, 2021). A Saudi Scientific Diabetes Society report highlights more than 50% Diabetes Mellitus (DM) sufferers ultimately die from cardiovascular problems (Robert & Al Dawish, 2020).

Incorrect = -1

Absent =0

Partially complete =1

Complete =2

10. Risk Factors:

i. Lifestyle-related factors like diet, stress, substance misuse, insufficient exercise, and inadequate sleep.

ii. Medical problems like damage/scarring of the heart, blood vessel problems, insufficient oxygen and nutrient supply to the heart, heart rhythm problems, leaky heart valves, increased blood pressure, high cholesterol, obesity and diabetes (Cleveland Clinic, 2021; Felman, 2021).

iii. Genetic issues such as a history of heart disease in the family

iv. Side effects of medication.

v. Age.

vi. Internal socio-psychological factors like anxiety and abuse.

vii. Existence of multiple personal, environmental and biological triggers (Cleveland Clinic, 2021; Felman, 2021).

Incorrect = -1

Absent =0

Partially complete=1

Complete=2

11. Symptoms: Buildup of fatty plaques in the arteries, along atherosclerosis (i.e., build-ups in the artery walls), may result in damage to blood vessels and the heart. A build-up of plaque results in narrowed or blocked blood vessels. This may in turn cause heart attacks, angina (i.e., chest pain) and strokes. CVD symptoms may however differ between men and women. Men tend to be more likely to experience chest pain, for example, while women tend to experience other symptoms in conjunction with chest discomfort, like shortness of breath, extreme fatigue, and nausea (Mayoclinic, 2021).

- **Physical Symptoms:**

Chest pain, tightness, pressure and/or discomfort (angina); breathlessness; pain, numbness, weakness and/or coldness in legs and/or arms; neck, jaw, throat, upper abdomen and/or back pain; very fast or slow heartbeat; palpitations; dizziness, lightheadedness, and/or feeling faint or

fatigued; swollen limbs (British Heart Foundation, 2021; Mayoclinic, 2021).

Incorrect = -1

Absent =0

Partially complete =1

Complete =2

- **Psychological Symptoms :**

Psychological symptoms which result from CVD include depression, anxiety, feelings of isolation, and diminished self-esteem. The National Institutes of Mental Health (NIMH) highlights that as many as 65 percent of CVD patients who have had a heart attack experience depression in some form. Prolonged depression in CVD sufferers can in turn contribute to further heart attacks and/or strokes (American Psychological Association, 2021).

Over the past few decades, knowledge regarding the relationship of psychological symptoms to CVD and CVD-related health outcomes have advanced considerably. Research has considered such aspects as:

i. Depression or depressive symptoms.

ii. Anger and aggressiveness.

iii. Anxiety.

iv. Psychosocial triggers (Everson-Rose & Lewis, 2005).

Incorrect = -1

Absent =0

Partially complete =1

Complete =2

- **Social Symptoms:**

i. Poorer workplace performance.

ii. Neglecting of hobbies and interests.

iii. The importance of social support systems which provide care and understanding and can also boost esteem.

iv. Social isolation which results from avoiding friends and social events.

v. Social problems, especially relationship issues (Everson-Rose & Lewis, 2005).

Incorrect = -1

Absent =0

Partially complete =1

Complete =2

12. Diagnosis:

- Diagnosis of CVDs involves various laboratory tests and imaging studies. These include blood tests, EKG/ECG (electrocardiogram), stress level testing, echocardiography, coronary angiography and cardiac catheterization, chest x-rays, EBCT (Electron-Beam Computed Tomography) along with cardiac Magnetic Resonance Imaging (MRIs) (Ananya Mandal, 2019).

- ❖ Diagnosis considers a patient's medical and family histories, risk factor prevalence, along with a physical examination (Ananya Mandal, 2019).

Incorrect = -1

Absent =0

Partially complete =1

Complete =2

13. Treatment and Prevention via early identification:

- **Treatment**
  - ❖ **Methods which have proven effective include:**

i. Pharmacological, medication, procedures, and surgery, such as a coronary artery bypass and grafting, along with valve repair or replacement surgery.

ii. Cardiac rehabilitation through exercise, prescriptions and/or lifestyle counselling (Felman, 2021; NHS, 2021).

- **Prevention via early identification:**
  - ❖ **Methods which have proven effective include:**

i. Psychotherapeutic:

a) Relationship therapy.

b) Setting of healthy boundaries.

c) Effective problem handling approaches.

ii. Lifestyle modifications:

a) Regular exercise.

b) Improved social support.

c) Balanced healthy diet.

d) Good quality and quantity of sleep.

e) Reducing stress.

f) No smoking.

g) Maintenance of an optimal blood pressure, along with normal low-Density lipoprotein (LDL)-cholesterol and glucose levels (Backer, 2017).

iii. **Alternative and complementary treatments include** vitamins and supplements**.**

Incorrect = -1

Absent =0

Partially complete =1

Complete =2

14. Complications:

i. Death.

ii. Other complications resulting in longer hospitalization.

iii. Physical disability.

iv. Increased care costs.

v. Central nervous system issues.

vi. Digestive issues.

vii. Cardiovascular system problems.

viii. Immune system problems (Mayo Clinic, 2021).

Incorrect = -1

Absent =0

Partially complete =1

Complete =2

TRANSPARENCY (Total Maximum score of 38)

Authorship, maximum score of 9

Authorship: The affiliations, interests and all other relevant credentials of all authors/contributors should be detailed (HON, 2020).

15. Is there disclosure of authorship? (HON, 2020)

0. No

1. Yes for some

2. Yes for all

16. Is there disclosure of author/s credentials? (HON, 2020)

0. No

1. Yes for some

2. Yes for all

17. Is the author a healthcare professional or expert? (HON,2020)

0. No

1. Yes for some

2. Yes for all

18. Are the credentials verifiable? (HON, 2020)

0. No

1. Yes for some

2. Yes for all

19. Are the author's contact details provided? (HON, 2020)

0. No

1. Yes

Authorship total: 9

Attribution, maximum score of 7

Attribution: References should clearly detail the sources for all provided content, with relevant copyright information also given (HON, 2020).

20. Is the source of information clear? (HON, 2020)

0. No

1. Yes for some

2. Yes for all

21. Are references given? (HON, 2020)

0. No

1. Yes for some

2. Yes for all

22. Is opinion stated as such? (HON, 2020)

0. No

1. Yes for some

2. Yes for all

23. Are any working external links provided to scientific reference material/studies? (HON, 2020)

0. No

1. Yes

Attribution total: 7

Currency, maximum score of 4

Currency: The date(s) that content was first published and then updated should be detailed (HON, 2020).

24. Is the date of creation of each page given? (HON, 2020)

0. No

1. Yes for some

2. Yes for all

25. Is the date of the last update clearly stated? (HON, 2020)

0. No

1. Yes

26. Has the site been updated within the last 4 months? (HON, 2020)

0. No

1. Yes

Currency total: 4

Disclosure: commercial interests, maximum score of 7

Disclosure: The website's ownership should be detailed, along with any relevant advertising, underwriting, sponsorship, and/or commercial funding arrangements. Any possible conflicts of interest should be fully and clearly disclosed (HON, 2020).

27. If the site is commercial is the source of funding clearly stated? (HON, 2020)

0. No

1. Stated on separate page

2. Yes

28. Is the site selling a product(s)? (England & Nicholls, 2004)

0. No

1. Yes

29. Does the site carry adverts? (England & Nicholls, 2004)

0. No

1. Yes

30. Does the site allow pop-ups? (England & Nicholls, 2004)

0. No

1. Yes

31. Is the privacy policy easy to find and clear? (HON, 2020)

0. No

1. Yes

32. Is personal information disclosed to the site sold to other organizations? (HON,2020)

0.No

1. Yes or unclear

Disclosure total: 7

Complementarity, maximum score of 1

Complementarity: Website content should supplement -- rather than replace – the relationship between a patient/site user and qualified medical professionals (HON, 2020).

33. Is there a statement confirming you should 'always ask your Doctor, Nurse or other health care professional for further advice' in relation to cardiovascular disease?

0 No

1 Yes

Complementarity total: 1

Kitemarks, maximum score of 5

The use of kitemarks was noted. The data in this case was nominal.

34. Does site have health related kitemarks/awards? (England and Nicholls, 2004)

0.No

1.Yes

35. Are the kitemarks/awards verifiable? (England and Nicholls, 2004)

0.No

1.Yes

36. Are the criteria for winning the award easily accessible? (England and Nicholls, 2004)

0.No

1.Yes

37. Does the awarding organisation still exist? (England and Nicholls, 2004)

0.No

1.Yes

38. Does the awarding body analyse content for accuracy? (England and Nicholls, 2004)

0.No

1.Yes

Readability, variable scale (Microsoft Word, 2016)

39. Flesch reading east test FRE –

The formula for the Flesch reading ease score is:

206.835 – (1.015 x ASL) – (84.6 x ASW)

Where:

ASL = average sentence length (the number of words divided by the number of sentences)

ASW = average number of syllables per word (the number of syllables divided by the number of words)

40. Flesch-Kincaid Grade Level test FKG –

The formula for the Flesch-Kincaid Grade Level score is: (0.39 x ASL) + (11.8 x ASW) – 15.59

Where:

ASL = average sentence length (the number of words divided by the number of sentences)

ASW = average number of syllables per word (the number of syllables divided by the number of words)

Navigability (Sandvik, 1999) Maximum score of 2

41. Can the website be easily navigated?

0 = information scattered around, no search engine.

1 = information only found with difficulty by following links.

2 = information easily found by following links to the homepage.

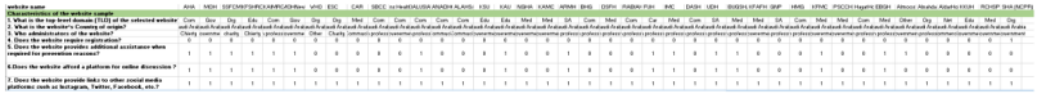
8.3 APPENDIX C: LIST OF SAUDI WEBSITES SAMPLED

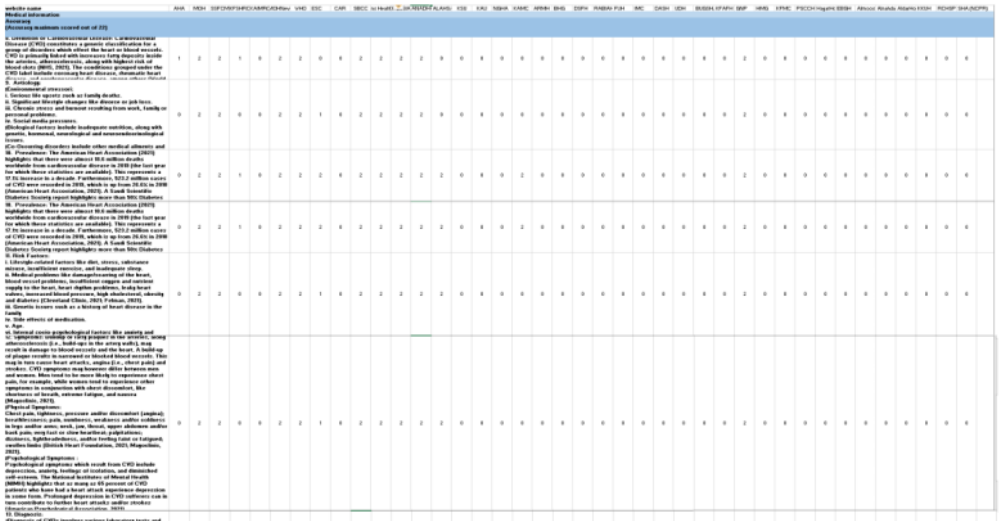
NO.	Website name	Website URL
1	AHA	https://saudi-heart.com/
2	MOH	https://www.moh.gov.sa/awarenessplateform/ChronicDisease/Pages/CardiovascularDiseases.aspx
3	SSFCM	http://www.ssfcm.org/public/parabic/content/secId/164/
4	KFSHRC	https://www.kfshrc.edu.sa/ar/home/research/departments/cardiovascularresearch
5	KAIMRC	https://kaimrc.med.sa/?p=7429
6	MOHNEWS	https://www.moh.gov.sa/en/Ministry/MediaCenter/News/Pages/News-2013-10-30-002.aspx
7	WHO	https://www.who.int/health-topics/cardiovascular-diseases#tab=tab_1
8	ESC	https://www.escardio.org/The-ESC/Press-Office/Press-releases/One-in-four-Saudis-heading-for-heart-attack-in-10-years
9	CAR	https://www.care.med.sa/Home/IndexAr
10	SBCC	https://sbccmed.com/
11	Siemens Healthineers	https://www.siemens-healthineers.com/en-sa/clinical-specialities/womens-health-information/laboratory-diagnostics/women-and-heart-disease
12	ANDALU SIAHJH	https://www.andalusiahjh.com/service/%D9%88%D8%AD%D8%AF%D8%A9-%D9%82%D8%B3%D8%B7%D8%B1%D8%A9-%D8%A7%D9%84%D9%82%D9%84%D8%A8

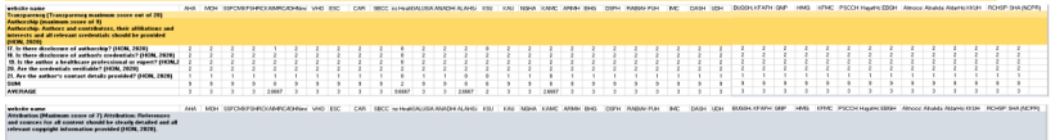
13	ASTERSANA DHOSPITAL	https://astersanadhospital.com/%D8%A7%D9%84%D8%AA%D8%AE%D8%B5%D8%B5%D8%A7%D8%AA/%D8%A7%D9%84%D9%81%D8%AD%D8%B5-%D8%A7%D9%84%D8%B7%D8%A8%D9%8A-%D9%84%D9%84%D9%82%D9%84%D8%A8/
14	Alahsahospital	http://alahsahospital.com.sa/view_health_education.php?id=4
15	KSU	https://medicine.ksu.edu.sa/en/node/2500
16	KAU	https://pcce.kau.edu.sa/Pages-StatisticsAr.aspx
17	NGHA	https://ngha.med.sa/arabic/medicalcities/alriyadh/medicalservices/pages/cardiaccenter.aspx
18	KAMC	https://www.kamc.med.sa/en/Pages/Cardiac-Center.aspx
19	ARMH	https://armh.sa/departments/%d8%a3%d9%85%d8%b1%d8%a7%d8%b6-%d8%a7%d9%84%d9%82%d9%84%d8%a8/
20	BHG	https://drbakhsh.com/MedicalServices/9001
21	DSFH	https://dsfh.med.sa/category/cardiology/
22	RABIAH	https://www.rabiahospitals.com/index-ar.php
23	FUH	https://fuh.care/specialties/heart-cardiology-and-vascular-system/
24	IMC	https://www.imc.med.sa/department/cardiac-center
25	DASH	https://dsah.sa/en/cardiology
26	UDH	https://udh.sa/pr-cardiology/
27	BUGSHAN	https://bugshan.med.sa/department-of-general-and-vascular-surgery/
28	KFAFH	https://kfafh.med.sa/CARDIACCENTERAR.html

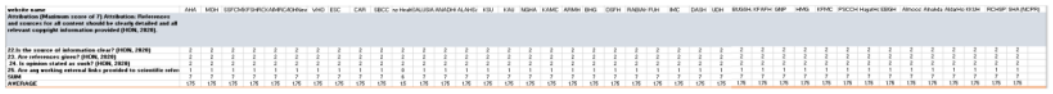
29	GNP	https://www.gnp.sa/departments/departmentDetails/7
30	HMG	https://hmg.com/ar/clinics/Cardiology/Pages/Cardiology.aspx
31	KFMC	https://www.kfmc.med.sa/EN/KingSalmanHeartCenter/Pages/Services.aspx
32	PSCCH	https://www.pscch.med.sa/portal/%d8%ac%d8%b1%d8%a7%d8%ad%d8%a9-%d8%a7%d9%84%d9%82%d9%84%d8%a8/
33	HayatHospitals	https://hayathospitals.com/part/%D8%B7%D8%A8-%D8%A7%D9%84%D9%82%D9%84%D8%A8/
34	EBGH	https://ebgh.med.sa/ar/?departments=%D9%88%D8%AD%D8%AF%D8%A9-%D8%A3%D9%85%D8%B1%D8%A7%D8%B6-%D8%A7%D9%84%D9%82%D9%84%D8%A8
35	AlmoosaHospital	https://almoosahospital.org/ar/departments/vascular-surgery-clinic/
36	AlnahdaHospital	https://alnahda-hospital.com/%D8%B9%D9%8A%D8%A7%D8%AF%D8%A9-%D8%A3%D9%85%D8%B1%D8%A7%D8%B6-%D8%A7%D9%84%D9%82%D9%84%D8%A8-%D9%88-%D8%A7%D9%84%D9%82%D8%B3%D8%B7%D8%B1%D8%A9/
37	AldarHospital	http://www.aldarhospital.net/demo3/
38	KKUH	https://medicalcity.ksu.edu.sa/ar/page/king-khalid-university-hospital
39	RCHSP	https://www.rchsp.med.sa/ar/Pages/Cardiology.aspx
40	SHA(NCPR)	https://ksacpr.org.sa/frmAboutUs.aspx

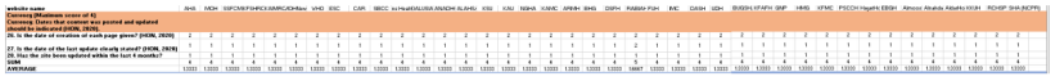
8.4 APPENDIX D: ANALYSIS OF ACCURACY, TRANSPRANCY, READABILITY, TRANSPRANY AND NAVIGABILITY SCORES

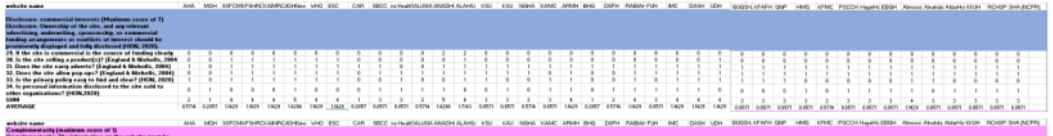


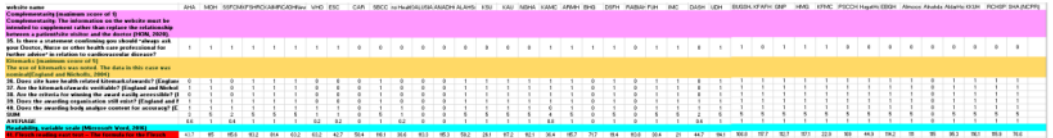




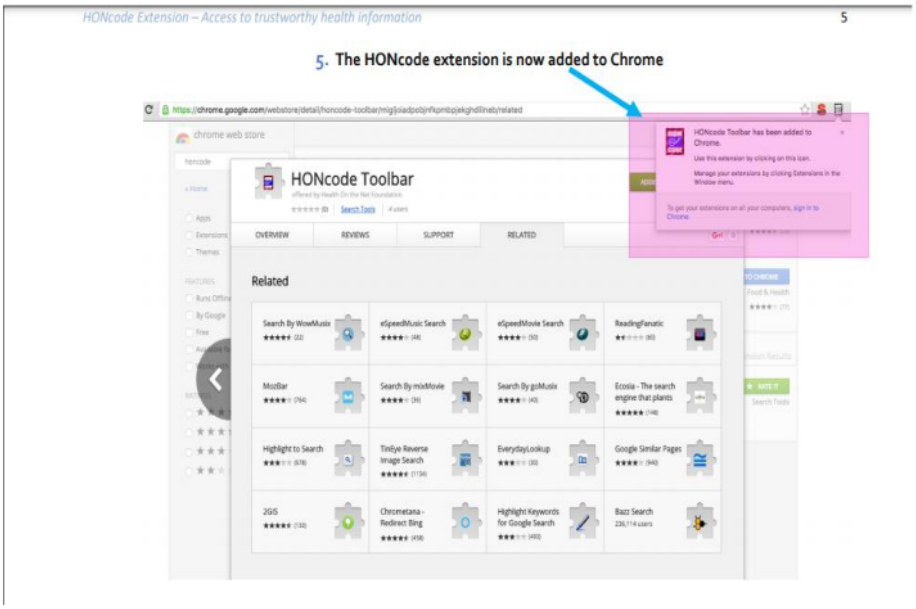


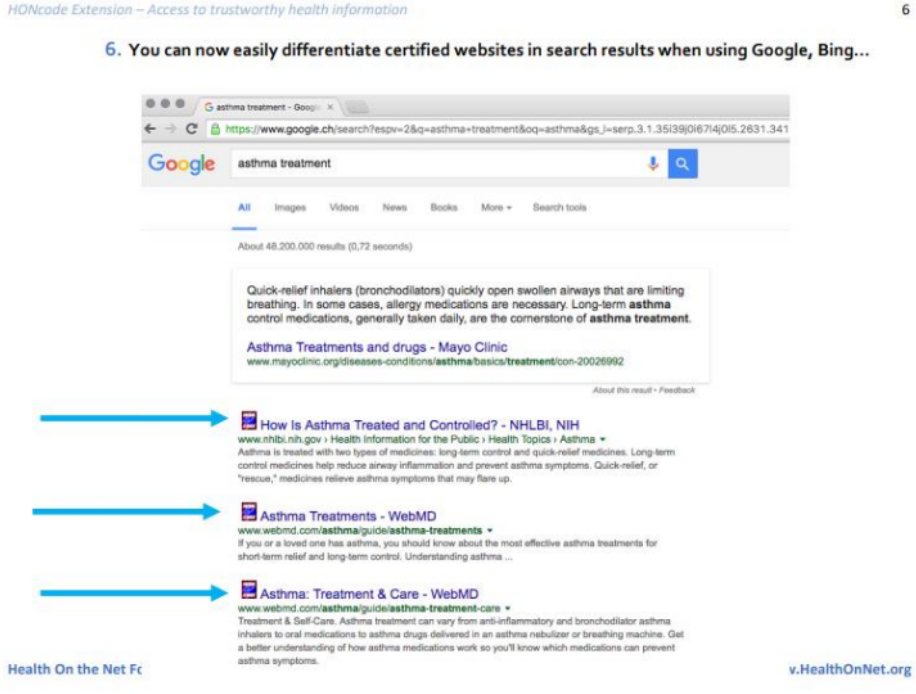






8.5 APPENDIX E: HONCODE TOOLBAR





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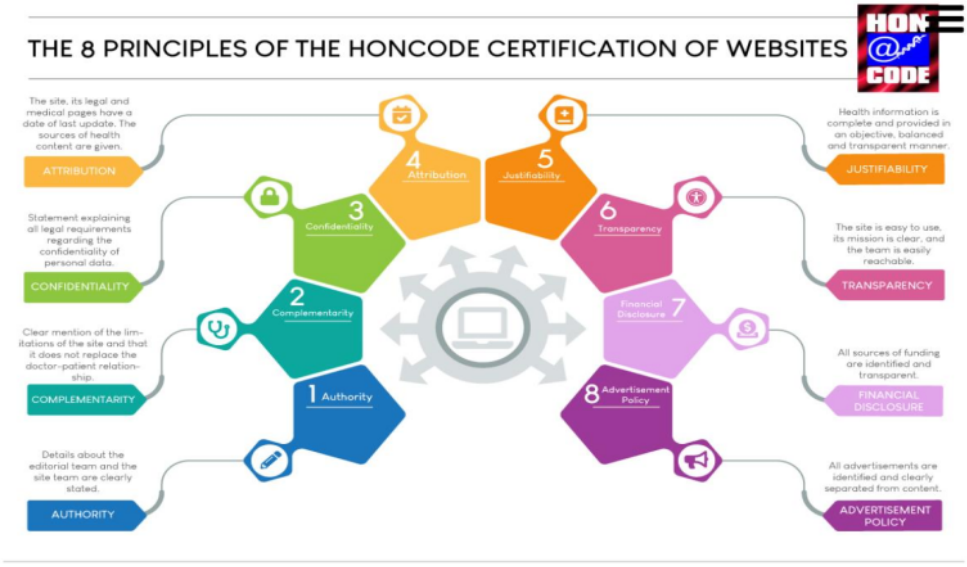
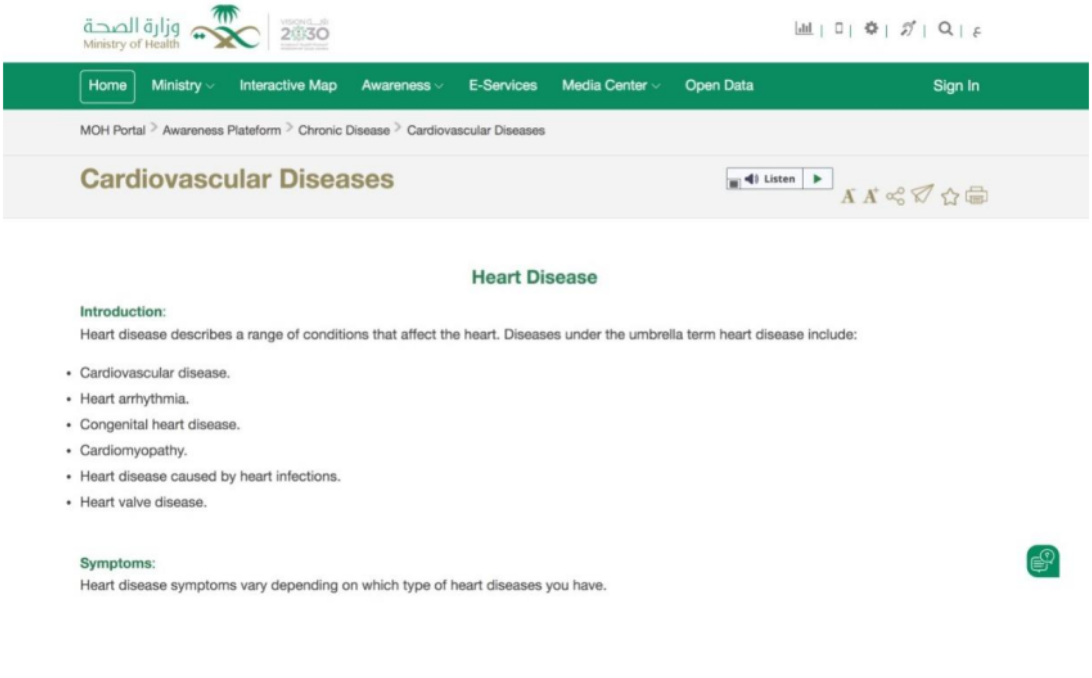
HEALTH ON THE NET



8.6 APPENDIX F: WEBSITE SAMPLED



8.6 APPENDIX G: CRONBACH ALPHA IF A QUESTION ITEM IS DELETED

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q4	33.13	48.830	-.096	.829
Q5	32.75	46.705	.250	.825
Q6	32.78	46.589	.271	.824
Q7	32.15	48.644	.000	.828
Q8	32.65	39.515	.789	.800
Q9	32.68	39.661	.775	.801
Q10	32.53	38.922	.768	.800
Q11	32.63	39.215	.789	.799
Q12	32.63	39.215	.789	.799
Q13	32.60	38.656	.847	.796
Q14	32.58	39.071	.776	.800
Q15	32.63	38.907	.820	.798
Q17	31.28	48.051	.059	.830
Q18	31.20	48.728	-.042	.830
Q19	31.20	48.728	-.042	.830
Q20	31.15	48.644	.000	.828
Q21	32.25	48.551	.000	.829
Q22	31.15	48.644	.000	.828
Q23	31.15	48.644	.000	.828
Q24	31.15	48.644	.000	.828
Q25	32.18	48.661	-.019	.828
Q26	31.15	48.644	.000	.828
Q27	32.13	49.035	-.188	.830
Q28	32.15	48.644	.000	.828
Q29	33.05	47.433	.167	.827
Q30	32.95	46.100	.433	.820
Q31	32.23	49.769	-.318	.834
Q32	32.30	47.908	.121	.827
Q33	32.63	47.676	.102	.829
Q34	32.58	48.661	-.038	.833
Q35	32.68	46.481	.276	.824
Q36	32.45	48.562	-.021	.832

Q37	32.43	48.712	-.043	.832
Q38	32.45	48.562	-.021	.832
Q39	32.38	48.343	.021	.830
Q40	32.33	47.661	.157	.827

8.7 APPENDIX H: DESCRIPTIVE STATISTICS OF WEBSITE QUALITY ITEMS

Descriptive Statistics

Quality Ratings Items		Sub-Items	N Statistic	Mean Statistic	Std. Deviation Statistic	Skewness Statistic	Skewness Std. Error
Accuracy	Accuracy	Definition	40	.50	.847	1.198	.374
		Aetiology	40	.48	.847	1.282	.374
		Prevalence	40	.62	.925	.841	.374
		Risk Factors	40	.53	.877	1.122	.374
		Symptoms	40	.53	.877	1.122	.374
		Diagnosis	40	.55	.876	1.046	.374
		Treatment and prevention via early identification	40	.58	.903	.976	.374
		Complications	40	.53	.877	1.122	.374
Transparency	Authorship	Disclosure of authorship	40	1.87	.463	-3.738	.374
		Disclosure of author/s credentials	40	1.95	.316	-6.325	.374
		Author a healthcare professional or expert	40	1.95	.316	-6.325	.374
		Verifiable Credentials	40	2.00	.000	.	.
		Author's contact details	40	.90	.304	-2.772	.374
	Attribution	Source of information	40	2.00	.000	.	.
		References	40	2.00	.000	.	.
		Opinion stated as such	40	2.00	.000	.	.
		External links	40	.97	.158	-6.325	.374
	Currency	Date of creation	40	2.00	.000	.	.
		Last update	40	1.02	.158	6.325	.374
		Updated within the last 4 months	40	1.00	.000	.	.
	Disclosure	Commercial source of funding stated	40	.10	.441	4.292	.374
		Product(s) selling	40	.20	.405	1.559	.374
		Carry adverts	40	.92	.267	-3.354	.374
		Allow pop-ups	40	.85	.362	-2.038	.374
		Privacy policy	40	.52	.506	-.104	.374
		Personal information sold to other sites	40	.58	.501	-.315	.374

	Complementarity	Statement to ask health professional	40	.48	.506	.104	.374
	Kitemarks/ Awards	Kitemarks/awards	40	.70	.464	-.907	.374
		Kitemarks/awards verifiable	40	.73	.452	-1.048	.374
		Criteria for winning the award	40	.70	.464	-.907	.374
		Awarding organisation	40	.78	.423	-1.369	.374
		Awarding body analyses content for accuracy	40	.82	.385	-1.778	.374
		Valid N (listwise)	40				

8.8 APPENDIX I: CORRELATION ANALYSIS OF WEBSITE QUALITY RATINGS

Correlations

		Characteristics	Accuracy	Authorship	Attribution	Currency	Disclosure	Complementarity	Kitemarks	Navigability
Characteristics	Pearson Correlation	1	.033	.185	.134	-.134	.035	.462**	.276	.[b]
	Sig. (2-tailed)		.839	.254	.409	.409	.830	.003	.085	.
	N	40	40	40	40	40	40	40	40	40
Accuracy	Pearson Correlation	.033	1	-.212	-.283	-.104	.194	.146	-.295	.[b]
	Sig. (2-tailed)	.839		.188	.077	.524	.230	.370	.064	.
	N	40	40	40	40	40	40	40	40	40
Authorship	Pearson Correlation	.185	-.212	1	.897**	.044	-.035	.175	.132	.[b]
	Sig. (2-tailed)	.254	.188		.000	.789	.832	.279	.417	.
	N	40	40	40	40	40	40	40	40	40
Attribution	Pearson Correlation	.134	-.283	.897**	1	.026	.027	.152	.221	.[b]
	Sig. (2-tailed)	.409	.077	.000		.875	.870	.348	.171	.
	N	40	40	40	40	40	40	40	40	40
Currency	Pearson Correlation	-.134	-.104	.044	.026	1	.126	-.152	-.302	.[b]
	Sig. (2-tailed)	.409	.524	.789	.875		.437	.348	.058	.
	N	40	40	40	40	40	40	40	40	40
Disclosure	Pearson Correlation	.035	.194	-.035	.027	.126	1	-.016	.084	.[b]
	Sig. (2-tailed)	.830	.230	.832	.870	.437		.924	.607	.
	N	40	40	40	40	40	40	40	40	40
Complementarity	Pearson Correlation	.462**	.146	.175	.152	-.152	-.016	1	.132	.[b]
	Sig. (2-tailed)	.003	.370	.279	.348	.348	.924		.415	.
	N	40	40	40	40	40	40	40	40	40
Kitemarks	Pearson Correlation	.276	-.295	.132	.221	-.302	.084	.132	1	.[b]
	Sig. (2-tailed)	.085	.064	.417	.171	.058	.607	.415		.
	N	40	40	40	40	40	40	40	40	40

Navigability	Pearson Correlation	.[b]	.[b]	.[b]	.[b]	.[b]	.[b]	.[b]	.[b]	.[b]
	Sig. (2-tailed)	.	.	.	.	.	.	.	.	
	N	40	40	40	40	40	40	40	40	40

**. Correlation is significant at the 0.01 level (2-tailed).

b. Cannot be computed because at least one of the variables is constant.