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The Need for Interdisciplinary Collaboration between Dental Professionals, Nurses and General Practitioners to Control NCDs

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ABSTRACT

Acute Numerous interventions have been put in place for the proper management of non-communicable diseases (NCDs). However, NCDs remain a large threat to the health of human beings. Therefore, interventions must be effectively and efficiently implemented and have the desired outcomes with a collaborative approach between healthcare providers. Because oral diseases share risk factors with some NCDs, and given that there is a two-way association between both groups of diseases, an argument could be made that integrating dental professionals in the management of NCDs can be a key component in an effective response to tackling NCDs. This is due to dentists being skilled and experienced in preventing, controlling, and detecting oral diseases, which share common risk factors with NCDs. Aside from engaging dentists in the management of NCDs, nurses are another group of healthcare providers who can play a significant role in the prevention and treatment of NCDs when effectively utilized and given their access to a large number of patients who attend their services at all levels of the health system. From primary health care facilities to referral hospitals, various strategies to handle NCDs can be used. However, integrating the dental team and Nurses in tackling NCDs would be the best approach to reach positive health outcomes.

Keywords: Non-communicable Diseases, Oral health, Risk Factors, Dental Health Services, Nurses

INTRODUCTION

Non-communicable diseases (NCDs) are one of the major health burdens worldwide. Currently, their prevalence is high in both high-income countries and low-middle-income countries [1]. Based on global prevalence, the most prevalent NCDs are cardiovascular diseases (CVDs), cancer, chronic respiratory diseases, and diabetes mellitus.

NCDs are associated with a high premature death rate, but they have also been linked with adverse social and economic impacts for patients and the wider health system [2]. This is in line with statistics reported by Narain J., where it was found that NCDs were associated with 7.9 million deaths among the South-East Asian community, and the author has also indicated that, if the situation remains unchecked, these deaths are expected

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to increase in the decades ahead [3]. Literature indicates that apart from ageing, the increase in the prevalence of NCDs is highly associated with the increasing prevalence of common risk factors such as smoking, unhealthy diet, excessive drinking of alcoholic beverages, as well as lack of physical exercise [4]. Given that evidence shows that NCDs share common risk factors with oral diseases [5], dental professionals may play a significant role in the prevention of oral diseases and NCDs by educating and advising patients about the consequences associated with shared risk factors between oral diseases and NCDs. Ultimately, that would indicate that any intervention measures that aid in the prevention and management of oral diseases could also help reduce the risk of developing NCDs and their progression.

Moreover, given the bidirectional association between NCDs and oral diseases [6], controlling oral diseases such as periodontitis may reduce the risk of developing some NCDs [7]. Therefore, the role of dental professionals is paramount in the early detection, prevention, and control of NCDs.

Interdisciplinary collaboration between dental professionals and general medical practitioners (GPs) to tackle NCDs could be highly encouraged in health facilities. In many countries' healthcare systems, GPs and dental professionals are engaged separately [8]. That could be one of the reasons for poor health outcomes following interventions in place.

In many countries, including Rwanda, nurses, a group of healthcare providers who represent the biggest part of health care workers, are always in close contact with the community in their daily work. According to the statistics of 2013, Rwanda had 9,488 nurses with a ratio of one nurse per 1,227 inhabitants, bigger than the number of GPs(678) who had the ratio of one doctor per 16,046 inhabitants [9].

Among other groups of health care providers, nurses always lead on the frontline of care and promotion of health in the community more than other healthcare providers. That is attributed to their open and close links with different individuals and their person-centered strategy to care [10], however, they a are not effectively engaged in tackling NCDs, yet they are well-positioned to intervene and help in reducing the burden of NCDs in Rwanda given their close connection with the community.

It has been observed in some other countries, that nurses as professional and as part of multisectoral teams, when they are coached and equipped with appropriate knowledge, skills and clinical practices on NCDs care, they can help to address NCDs and the risk factors that contribute to the growth of NCDs burden [11].

Identifying appropriate interventions and necessary areas for interdisciplinary care between medical providers will be an effective approach to handle NCDs. Hence the objectives of this review are to highlighting the existing evidence on the association between oral diseases and NCDs, providing an opinion on possible integrated health policies to contain NCDs in Rwanda and emphasizing the importance of improving intersectoral collaboration between the dental team, Nurses and GPs, to establish an effective response to controlling NCDs.

COMMON RISK FACTORS FOR ORAL DISEASES AND NCDs

Risk factors such as tobacco consumption and inhalation, daily consumption of unhealthy foods, excessive use of alcoholic beverages, poor oral health, and lack of exercise have been stated as common risk factors to both oral diseases and NCDs [5]. Designing an intervention that addresses all five common risk factors can effectively reduce the prevalence of NCDs.

Unhealthy diet

Diet is one factor that plays an important role in the initiation or progression of various human diseases, including dental diseases and NCDs. An unhealthy diet is linked with abnormal weight gain, and it is associated with an increased risk of NCDs [12]. Various studies have highlighted alarming data between the association of being overweight and acquiring an NCD [13]. One follow up study, conducted for 10 years, to assess the impact of being overweight on the risk of developing common chronic diseases, found that people who were overweight had the risk of developing numerous chronic diseases such as diabetes mellitus, hypertension and heart disease in both genders [14]. In this same study, research has also indicated that compared to other chronic diseases, diabetes mellitus was highly associated with being

overweight, to the extent that overweight (BMI ≤ 35) people are 20 times more likely to develop diabetes mellitus. In another study done by Lim et al., the results have suggested that dietary factors such as low consumption of vegetables, fruits, and nuts and excessive consumption of red, processed meat as well saturated fats, were important contributors in increasing the risk of developing cardiovascular diseases, cancer and diabetes [15].
Poor diet is also linked with oral diseases, as diet can contribute to developing some oral infectious diseases and other oral conditions [16].
Furthermore, some high sugary drinks and foods have been suggested to be associated with other NCDs such as diabetes mellitus, stroke, heart disease, and obesity [15]. Since many risk factors for dental diseases and NCDs are common, dental professionals can play a crucial role in preventing oral diseases and NCDs in providing daily advice on risk reduction for dental diseases in terms of safe food regimes.

Smoking

Tobacco use is a pandemic that is responsible for a large proportion of global mortality. In 2008, tobacco smoking was reported among the three leading causes of death, alongside high blood pressure and obesity [18].
Smoking is associated with oral diseases. The consequences of tobacco use in the oral cavity include teeth staining, halitosis, interference with the normal oral wound healing process, and defects in taste buds. Therefore, tobacco smoking increases the risk of developing periodontitis, oral mucosal lesions, as well as oral cancer [19].
Apart from oral cavity defects associated with smoking, tobacco smoking has been identified as a risk factor for developing NCDs, such as cardiovascular disease, respiratory diseases, and cancers such as lung cancer [20].
Based on the magnitude of negative effects of smoking on both oral health and general health, a collaborative approach between medical professionals and dentists is needed to educate the public to avoid and cease smoking in order to reduce the incidence of oral diseases and NCDs [21].

Alcohol

Excessive consumption of alcohol is associated with social consequences alongside dental and general adverse health outcomes. According to the WHO global report of 2014 on alcohol and health, 3.3 billion deaths occur per year due to alcohol abuse, representing 5.9% of all global deaths. The same report has indicated that alcohol abuse causes more than 10% of deaths of all NCDs, mostly due to deaths from pancreatitis, hemorrhagic stroke, and cancers, such as oral cancer, pharynx, liver cancer, and colorectal cancer [22].
High consumption of alcoholic drinks can comprise salivary gland function, which ultimately may lead to dental caries and tooth erosion, inflammation, and irritation of oral soft tissues and increases the risk of developing oral cancer [23]. Excessive alcohol consumption is also associated with economic consequences, as indicated in one study conducted in the United Kingdom (UK), which showed that the UK loses more than £3.3 billion per year due to alcohol-related ill health [24].
As oral diseases and NCDs share some common risk factors such as high consumption of alcohol, dental professionals can minimize the risk of developing NCDs by educating patients about alcohol-associated consequences on general and oral health

ASSOCIATION BETWEEN ORAL HEALTH AND NCDs

The results of numerous studies have shown a bidirectional association between NCDs and oral diseases [25], as some systemic diseases influence oral health via pathological processes. Conversely, pathological changes in the oral cavity can be risk factors for some NCDs [26].

Periodontitis

Periodontitis is also known as gum disease, which is the infection of the oral cavity that affects first the soft tissues around the tooth. If untreated, it can spread to the alveolar bone supporting teeth and lead to tooth loss. The main cause of periodontitis is the mass bacteria commonly known as dental plaque, which is accumulated around the teeth and the margin of the gum, leading to the destruction of the periodontium [27].
Pathologically, this is due to the host's exaggerated inflammatory immune response in the gingiva and periodontal tissues against infectious agents [28]. Periodontitis is a chronic oral disease and it is associated with local effects on the teeth, as

well as on the tooth-supporting tissues, and some NCDs [29].

Some hypotheses have been proposed to explain the pathological process of periodontitis; briefly, the accumulation of bacteria plaque around the teeth causes inflammation of the gum. The progression of bacterial infection causes the periodontium to become extremely destroyed[30]. The tissue damage of the periodontium has been attributed to over secretion of pro-inflammatory molecules, including prostaglandin E2(PGE2), matrix metalloproteinases (MMPs), tumor necrosis factor-alpha (TNF-α), and Interleukin -1 beta(IL-1β), which are released from macrophages and other cells [31]. Furthermore, periodontitis can trigger and influence the progression of some NCDs through bacterial substances and host-derived inflammatory mediators [32].

Periodontitis is estimated to be one of the risk factors in the complex pathogenesis of some NCDs such as cardiovascular disease, diabetes mellitus, kidney disease, cancer, and chronic respiratory diseases [33], due to its nature as a chronic inflammatory disease, leading to a long-lasting immunological response which can damage further organs and trigger system conditions. Additionally, many studies have indicated that there are also some systemic diseases and conditions that have been shown to play a vital role in increasing the risk of developing the periodontal disease [34].

Oral health and cardiovascular disease

The risk of developing cardiovascular in patients with periodontitis is gradually increasing, and it is considered the major cause of mortality for these affected patients [35]. Numerous cohort and case-control studies conducted have shown a significant association between periodontitis and increased risk of cardiovascular disease [36], however, some studies have also failed to prove this association [37].

Studies have shown that possible mechanisms associating periodontal infection to the development of atherosclerotic diseases ultimately leads to the triggering of clinical coronary disease [38]. Periodontitis is linked with the production of an increased amount of serum biomarkers that include C-reactive protein, inflammatory cytokines, and fibrinogen, which appear to increase the risk of cardiovascular disease [39]. However, a definitive causal relationship has not yet been fully proven.

In a published review, results of nine cohort studies conducted on the association of periodontitis and cardiovascular disease estimated that 19 % of the population with periodontitis of all ages had a risk of developing cardiovascular disease, and those aged 65 years old or less who had periodontitis have the risk of 44% of developing cardiovascular disease [40]. Therefore, there is a moderate risk of developing cardiovascular when suffering from periodontitis. Hence action needs to be taken to prevent and stop the progression of periodontitis to avoid further complications on overall health, given the high prevalence rate of periodontitis in the population [41].

One study indicates that periodontal treatment can play an imperative role in preventing and reversing systemic conditions such as improvement of cardiovascular outcomes as well as endothelial function [7].

Oral health and Diabetes Mellitus

Diabetes mellitus is one of the NCDs with a high global prevalence. It is caused by metabolic dysregulation characterized by high blood sugar due to either abnormal secretion of insulin, abnormal insulin action, or a combination of both [42]. Various studies have reported that the prevalence of diabetes mellitus is increasing and that the number of deaths per year as a result of diabetic complications around the globe has risen to 5 million, which is higher than the number of deaths per year caused by malaria, AIDS, and tuberculosis [43].

Studies suggested that periodontal infection might have a bilateral relationship with diabetes, as diabetes has been correlated with the risk of developing periodontitis in the oral cavity [44]. Conversely, other studies have suggested that periodontitis is a chronic inflammatory disease that leads to poor glycemic control, which could be explained by the fact that infections reduce the capacity of cells to absorb glucose and that both inflammatory mediators and endotoxins interfere with the efficiency of insulin [45].

Other studies have indicated that the treatment of periodontal infections in diabetes patients could play an imperative role in improving glycemic control through the reduction of glycated hemoglobin (HbA1c) [28]. This is in accordance with many epidemiological studies conducted and proves that diabetes mellitus is a risk factor for periodontitis. The risk of developing severe periodontitis with alveolar bone loss is high in

patients with poorly controlled diabetes [46]. The pathological process explaining this two-way relationship between periodontitis and diabetes mellitus is not yet fully explained. Still, some studies have indicated that this mechanism passes through neutrophils actions, cytokine activity, and inflammatory immune responses characterized by abnormal regulation of secretion of host inflammatory mediators and tissue breakdowns such as TNF-α, IL-1β, IL-6, IL-12, IL-18, PGE2 and MMPs [47].

One review conducted by Tylor, intending to assess the association between both periodontitis and diabetes, showed that diabetes increases with the incidence and prevalence of periodontitis [44]. Complementary results were found in another study done in the USA, by analyzing data from the National Health and Nutrition Examination Survey (NHANES) III, which showed that out of the 31,311 individuals in the NHANES database, 1291 people were diagnosed with periodontitis 161(12.5%) had diabetes, 12178 patients with non-periodontitis only 767(6.3%) had diabetes. Out of the 928 patients who self-reported to have diabetes, 161(17.3%) of them had periodontitis [46]. The same article has shown that periodontitis is more prevalent in people with diabetes. The prevalence of diabetes in patients with periodontitis is two times higher compared to patients with non-periodontitis.

Researchers should focus on the relationship between periodontitis and diabetes to understand its nature, as diabetes has been suggested as a risk factor for periodontitis and periodontitis has been linked with a huge impact on glycaemic control [48].

Oral health and cancer

The systemic spreading of some pathogens and inflammatory mediators is linked with some oral diseases and this may promote the pathogenesis of inflammatory processes and cancer [49]. Inflammatory responses have been suggested to play an imperative role in tumorigenesis, from initiation up to metastasis phases. In the last decade, 20 % of total cancers were associated with chronic infections and, 30,35,20% of cancers were associated with tobacco use, dietary factors, and obesity, respectively [50].

Periodontal disease is one of the chronic inflammatory diseases found in the oral cavity and it has been linked with numerous NCDs, including cancers [51]. Understanding the association between periodontitis and the risk of developing cancers is still a challenge due to insufficient data. However, studies have suggested that periodontal disease as an oral chronic inflammatory disease is linked with the risk of developing cancer [52]. This association has been observed mostly between periodontitis and oral cancer and pharyngeal cancer; however, that association between periodontitis and both types of cancers has been suggested as a weak association [53].

The results of one prospective study conducted in the United States, to investigate the association between periodontitis severity with the risk of cancer, found there was a strong association between periodontitis and the risk of developing lung cancer (Hazard ratio) HR=2.33, 95% CI 1.51 to 3.60) and there was a strong association between severe periodontitis and risk of developing colorectal cancer among non-smokers participants (HR 2.12, 95% CI 1.00 to 4.47) [54], a research team in this same study has shown that there were no association between periodontitis and the risk of breast, hemopoietic and prostate cancers.

A cohort study conducted in Taiwan, aimed at assessing the association between periodontitis and gingivitis with the risk of developing cancer, showed that the incidence rate of cancer was higher in patients with periodontitis (IR =1.4 times, HR = 1.5,95% CI 1.00 to 1.11) when compared with the control group [45]. Furthermore, patients with periodontitis had a high risk of developing oral cancer at the hazard risk of 1,79 with 95% CI 1.42 to 2.25 [55].

Based on available data on the association between chronic inflammatory periodontitis and cancers, we would suggest that any intervention designed to prevent cancers should take into consideration periodontal disease status as an important covariate risk factor for developing cancers. Therefore, we would suggest that early treatment of periodontal disease could reduce the risk of developing some cancers linked with periodontitis. This could justify the indirect role of dental professionals in the prevention of cancers.

Apart from periodontitis to be considered as the risk factor for oral cancer, the are other epigenetic and genetic risk factors that can contribute to the development of oral cancer. Studies have indicated that among epigenetic factors, uncontrolled smoking, drinking, and betel nut chewing increase

the risk of oral cancer [56], some other factors like human papillomavirus infection, lichen planus, and bad oral health would implicate in oral cancer development [57,58]. Researchers have listed genetic predisposition as an important risk factor for oral cancer [59]. It is believed that genetic changes in tumor suppression genes play an immense role in the development of oral cancer [60]. Dental professionals must have enough knowledge of the risk factors of oral cancer to raise awareness of their clients as a way of preventing NCDs

THE INTER-PROFESSIONAL APPROACH BETWEEN DENTISTS, NURSES AND GENERAL PRACTITIONER TO TACKLE NCDs

Currently, diagnosis, treatment, and prevention of NCDs in different hospitals or general clinics is a task assigned to a GP. Despite the efforts provided by GPs in the management of NCDs, the prevalence of NCDs remains a big threat to public health [61] and requires the further engagement of healthcare providers to fight against the NCD burden.

Dental professionals are known to be skilled and experienced in the prevention and early detection of oral diseases. They are crucial in preventing NCDs, based on the fact that oral diseases share some risk factors with some NCDs [26], and given that there is a bi-direction association between both types of condition. An argument could be taken that dentists are in a good position to risk assess and give preventative advice for NCDs. Besides, they can even engage in NCDs control in some circumstances [62].
This is in line with the UK's government policies and guidelines released in 2012 for advocating the importance of other health care providers such as dental professionals as well as pharmacists in the risk-assessment of type 2 diabetes mellitus (T2DM) [63].

Beyond that, dental professionals are in an advantageous position to influence the management of NCDs, based their accessibility to a large proportion of the population, allowing them to disseminate preventative advice, risk assess for some health conditions, and allow for early detection of some diseases when compared to GPs [64]. This is complemented by the results of one study by Yonel et al., which showed that allied healthcare services are more frequently visited by the community when compared to the services provided by GPs [50]. Moreover, the same results have shown that 12% of all patients who visited the dentists every six months did not visit GPs within the same whole year, and, 48% of attendees who reported visiting their dentists for a regular oral health checkup had also reported that they had never visited their GPs for a general health checkup [65].

Supporting results were also found in another study conducted in the United States in 2008, where it was found that 23 % of participants had visited dental services. However, 24 % of participants reported that they had not visited general medical practitioners at all [66]. It is, therefore, possible that dental professionals have access to a number of patients who don't visit other medical services, and so they may be in a good position to risk assess, to prevent and control NCDs and offer additional support to GPs

On the other hand, based on the shortage of GPs in charge of managing NCDs in many health facilities in Rwanda, an integrated approach that promotes partnership between GPs and Nurses would be another boost that will not only help to reduce the burden of NCDs but also it will help to minimized the heavy workload on GPs as well as helping to extends NCDs services in underserved areas where nurses are always available to serve the community [67]. Supplementation of nurses in the management of NCDs has been introduced in some other countries and its benefits are well recognized, for instance, in Zimbabwe, better health outcomes were recorded when nurses were engaged in the management of NCDs in primary healthcare clinics and hospitals [68]. Botswana is another educative model country with positive outcomes. They engaged nurses in integrated task-sharing activities with GPS for suppressing NCDs, specifically in the diagnosis and management of cervical cancer [69]. The integrated approach has been utilized in different healthcare settings, specifically in managing health threats, and has given impactful results. In low- and middle-income countries, community healthcare workers have been integrated into the prevention and reduction of maternal and child mortality, and impressive results have been recorded since the introduction of this program [70].

OPINION ON POSSIBLE INTEGRATED HEALTH POLICIES TO PREVENT AND CONTROL NCDs IN RWANDA

According to the statistics from the Rwandan census 0f 2012, Rwanda had doubled its population from 4.8 million(1978) to 10.5million(2013). The number of children per woman has reduced from eight to four children in the same period, which indicated that Rwandan has an ageing population and the demands of NCDs care services by the people is more likely to rise [71], and at the same time the workload of GPs is also expected to increase, therefore to cope with these changes, Rwanda will need to remodel NCDS health policies and services, and decentralize them in primary health facilities, to ensure that the mobility and mortality related to NCDs are reduced [72].

Rwanda may achieve this vision through; by emphasising the building of healthcare providers (Dentists and nurses) by training them on advanced care of NCDs to share tasks with GPs in managing some NCDs cases.

Integrating NCDs care courses in both nursing and dental schools in Rwanda.

Enable trained nurses to work closely with high-risk populations in health centers to prevent and early detect NCDs cases would help to suppress NCDs in Rwanda

Review and reinforcing existing programs of increasing community awareness on NCDs risk factors.

Organizing periodic community outreach programs on NCDs, conducted by nurses, dentists, GPs, and medical students.

Preparation of annual mass screening on NCDs in different health centers of the entire country.

Organizing public talks coordinated by government officials and hospitals regarding NCDs.

Support and encouraging monthly mass sports activities to minimize some risks associated with NCDs. Government officials, hospitals, medical providers, teaching institutions, medical councils, and community members are encouraged to consider these suggestions as they are fighting against NCDs in Rwanda.

We hope that the implementation of this approach of integrating the dental team and nurses into the management of NCDs would lead to the reduction of NCDs and the provision of accessible, coherent, and high-quality services for patients.

CONCLUSION

Despite the efforts made by different governments as well as medical professionals in the management of NCDs, NCDs are still among the top causes of global deaths. Literature has proved a two-way association between dental diseases and NCDs, and they both share common risk factors. Dental professionals are known to be skilled in the detection and control of dental diseases and provide preventive advice regarding the consequences associated with an unhealthy diet, smoking, and excessive consumption of alcohol, which are the commonly shared risk factors for both conditions. Due to the nature of their work and regular contact with patients, the dental team is in an ideal position to simultaneously help in the prevention, detection, and control of oral diseases as well as NCDs. Nurses are another proven workforces that can effectively support existing manpower to suppress NCDs in Rwanda when trained and coached before being engaged, thus their integration in NCDs management health team. Moreover, the integration of Dentists and Nurses will not only reduce NCDs burden but also it will help to reduce the workload of GPs.Therefore, a multidisciplinary approach in handling NCDs is highly encouraged in Rwanda as well as in other countries as an effective solution to contain NCDs.

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