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Article

Prevalence of General Health Diseases and Conditions Among Rural Adults †

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Featured Application: Authors are encouraged to provide a concise description of the specific application or a potential application of the work. This section is not mandatory.

Abstract: (1) Background: a study was undertaken to determine the prevalence of chronic diseases and health conditions that affect oral health and oral health self-care among independent living older adults in rural areas of Victoria, Australia; (2) Methods: The study analysed data from the Crossroads-II project, with a total of 1407 participants aged 55 years and older. Participants self-completed questionnaires about health conditions, service use, and demographics. 572 attended a 2-hour health screening that included an assessment of prescribed medications; (3) Results: Most participants were female (55.3%), with a mean age of 69.1 (SD=9.2) years. Participants had a high prevalence of medical conditions, the most common were high blood pressure, arthritis, high lipids, hearing loss, and chronic pain. Almost all participants reported taking medications, with an average of 4.3 medications per person. Among those who attended the health screening, 78.1% were taking medications that could cause xerostomia (dry mouth); (4) Conclusions: This study provides initial information on the prevalence of medical conditions, medication usage, with potential impact on oral health of older adults living in rural Victoria. This information would be valuable for healthcare and dental workforce planning, policy development, and improving the overall well-being of this population.

Keywords: oral health; xerostomia; Australia; non-communicable diseases

1. Introduction

Australian rural and remote populations are characterized by their varied locations, compositions, and sizes. However, one common trend across these populations is accelerated ageing when compared to their urban counterparts. This demographic transition brings forth considerable challenges for healthcare professionals, as it not only necessitates adapting to changing disease patterns, but also requires specialized care tailored to the unique needs of rural and remote communities [1,2].

Furthermore, as countries undergo this demographic transition, they also experience an epidemiological transition. This shift necessitates an enhanced emphasis on the prevention and management of non-communicable diseases, including oral health conditions like dental caries and periodontal diseases. These conditions pose a significant global health burden and require a robust public health response to mitigate their impact [3]. Addressing these oral health issues is crucial in improving overall health outcomes and quality of life, particularly as populations age and chronic conditions become more prevalent. More specifically, they have a vital role in promoting the understanding of the bidirectional relationship between oral health and systemic health. They are well-positioned to convey the message that oral health and general health are interconnected. Their

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awareness, communication, and education efforts can contribute to improved health outcomes for patients, particularly among older populations.

The recognition of oral health as an integral part of overall health has gained attention from organizations such as the World Health Organization [4,5], World Dental Federation [6,7], and national health strategies [8,9]. The global oral health status report indicates that oral diseases pose a serious burden to health affecting 3.5 billion around the world making them the most prevalent non-communicable diseases (NCD) [3]. Additionally, oral health professionals should have a comprehensive understanding and familiarity of their patients' general health conditions. This knowledge is essential because issues in the mouth have an impact on the health of the entire body, and systemic conditions can manifest in oral health problems. Conditions like diabetes, heart disease, and immune disorders have reciprocal links and as such can influence oral health and vice versa.

The emerging and growing evidence of the associations between oral health and other non-communicable diseases (NCDs) has gained substantial support, confirming the existence of strong interconnections between these conditions [10–16]. While the evidence of influence varies in strength across different diseases, there is now a heightened awareness that neglecting oral hygiene can have consequences that extend beyond oral health. Numerous biological mechanisms have been proposed, such as the entry of mediators of oral inflammation into the bloodstream, contributing to systemic inflammation [17–19], as well as the potential development of aspiration pneumonia [20]. Notably, improving oral hygiene in nursing homes could potentially prevent one in ten cases of pneumonia-related deaths [20].

This also underscores the importance of considering the unique oral health challenges faced by older populations. As people age, they may be more susceptible to oral health issues, and other systemic health conditions and medications may have a more pronounced impact on oral health, such as causing xerostomia (i.e., dry mouth). The risk of xerostomia is a particular concern. Insufficient saliva production can contribute to dental problems such as cavities, gum disease, and oral infections. The severity of xerostomia can vary, ranging from mild discomfort to more severe complications affecting oral health. However, it should be noted that not everyone taking these medications will experience dry mouth. This is also important because a dry mouth may indicate dryness in other mucous membranes in the body [21]. Thus, being aware of the medications that their patients are taking is crucial. Some medications can have side effects that affect oral health

To reinforce awareness among clinicians, researchers, and administrators regarding systemic conditions' impact on oral health, this paper, as part of a larger effort organised in the Australian state of Victoria (The Crossroads-II project), aims to provide a comprehensive profile of the prevalence and distribution, by selected socio-demographic characteristics, of chronic diseases and health conditions including those which impact on the oral health and oral health self-care of independent living older adults in rural areas of the state of Victoria. The Crossroads-II (XRoadsII) study is one of the largest and most comprehensive studies of rural health in Australia, providing valuable data for service planning and delivery to ensure equitable access to healthcare across the Goulburn Valley (GV) region of Victoria, Australia [22].

By understanding this prevalence, and highlighting this relationship, among both healthcare providers and the public, it is hoped that oral health can be better acknowledged as an integral part of overall health and personal well-being, with a focus on preserving and maintaining oral health-related quality of life of older adults. This information is valuable for health and welfare providers and caregivers to better understand the oral health implications of common systemic diseases and their treatment, improving health outcomes and social well-being within the communities they serve. Additionally, it aids in identifying and prioritizing oral health diseases and conditions.

2. Materials and Methods

2.1. Study Design and Participants

The study is a secondary analysis of the (XRoadsII) study. The (XRoadsII) study was designed as a cross-sectional survey of randomly selected households in the Goulburn Valley (GV) of regional Victoria, Australia to assess prevalence of chronic health conditions, self-reported health, health

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behaviour and access to care and use of health services. With the approval granted by the Goulburn Valley Health Ethics Committee (GVH 20/16), informed consent to participate in the study was obtained from each participant aged 16 years or older. Separate, individual written consent was obtained for a more detailed clinical assessment including dental examination [22]. Half of the adult household survey participants were invited to attend the health screening clinic. Data were collected between October 2016 and October 2018.

A total of 1407 people aged 55 years and older, residents of rural areas of Victoria took part in the survey and were included in the present analysis. Participants self-completed a series of questionnaires asking about health conditions (n=25), service use, concerns about health care and demographic questions. Of this group, a total of 572 attended a 2-hour health screening that included prescribed medications.

2.2. Data Collection

The data collection instrument included a series of questionnaires examining a variety of topics, including participants´ socio-demographic characteristics, diet, exercise, social connectedness, smoking, alcohol intake, chest pain, health knowledge and attitudes, oral health, caffeine intake, marijuana use and pesticide exposure, women's health (as applicable). For the present analysis the following variables were included:

a) Socio-demographic: sex; age measured at the time of the examination and regrouped into three groups: '55 to 64'; '65 to 74'; and '75 and older'; marital status, coded as 'Single/Separated/divorced'; 'Widow/widower'; and 'Married/de facto'. Participants' level of formal education was classified into the following categories: 'Some secondary', 'Secondary complete', 'Trades', 'Tertiary education', and 'Other'. Additionally, data on locality of residence were collected, distinguishing between regional centres (i.e., Shepparton/Mooroopna) and Shire capitals (including Benalla, Cobram, and Seymour). Furthermore, participants were questioned about their health insurance coverage, including eligibility for a health care/pensioner card.

b) Oral health questions included the self-assessed number of natural teeth recoded into two groups: 'No teeth'; 'Partial/None missing'.

c) Medical history was assessed by asking participants' medical history based on the presence or absence of 25 medical conditions, including but not limited to arthritis, heart conditions, high blood pressure, respiratory problems, allergies, hearing loss, kidney problems, liver diseases, diabetes, and depression. A health conditions score was computed by summing the number of positive responses to these conditions.

The assessment also included conditions that may affect, or make it difficult, self-care, including oral hygiene; blindness and visual difficulties; audition impairments, and disability affecting arms and fingers. It was considered that this disability would affect manual dexterity.

Self-reported disabilities affecting feet and legs, were also included. It was considered that this would be indicative of difficulties accessing health care services.

d) As part of the medical history, participants were questioned about their current medication regimen, including the number of medications they were taking. Additionally, they were prompted to list up to seven medications they were currently using. Subsequently, these medications were categorized according to their potential to induce xerostomia. These included medication for six conditions: heart conditions; high blood pressure; arthritis; anxiety; allergies; and sleeping medications [23].

e) Participants were also asked about various risk behaviours, including their alcohol and tobacco consumption habits. They were inquired about the frequency and quantity of alcohol they typically consume, as well as whether they are current or past smokers, and how many cigarettes they smoke per day [24,25].

f) To better understand the broader context of participants health and well-being, participants were queried about their involvement in social activities, such as participating in clubs, organizations, or community events, to gauge their level of community engagement and social support networks.

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2.3. Data Analysis

The analysis provides descriptive information on the crude prevalence of General Health Diseases and Conditions in the population is described in terms of frequencies distribution and by selected socio demographic characteristics. To determine differences between groups on health and medical conditions, ANOVAs and Chi-square tests were employed. A significant ANOVA was followed by post-hoc comparisons using Tukey's Honestly Significant Differences tests. Data manipulation and analyses were conducted using IBM-SPSS Statistics (Version 29.0).

3. Results

A total of 1407 aged 55 years and older were included in the present analysis. Of them, the majority (55.3%) were female. The participants' mean age was 69.1 (SD=9.2) years. Almost half (49.6%) had primary education only or incomplete secondary education; 21.5% had secondary completion or trades certification, and 18.2% had at least some tertiary education. Another 10.7% did not have well-defined levels of education. More than half of the participants (53.9%) were from the shire capitals of Benalla, Cobram, and Seymour, while 46.1% were from the regional center of Shepparton/Mooroopna. Details of the sample's sociodemographic characteristics are provided in Table 1.

Table 1. Socio-demographic characteristics of older adults living in rural Victoria, Australia.

Variables		
Mean age (years)	69.1 (SD =9.2)	
	categories	% [1]
Sex	Male	44.7
	Female	55.3
Education	Some secondary	49.6
	Secondary complete	8.2
	Trades	13.3
	Tertiary	18.2
	Other	10.7
Location	Benalla/Cobram/Seymour	53.9
	Shepparton/Mooroopna	46.1

[1] n=1407.

Regarding self-reported medical conditions three participants reported no medical conditions, another 164 participants (11.6%) reported 1 or 2 medical conditions; 30.7% reported from 3-5 conditions; 6-10 conditions were reported by 41.6% of participants; and 16.1% reported between 11 and 19 conditions. The average number of self-reported medical conditions was 6.7 conditions per person (SD=3.7). The medical conditions most reported were high blood-pressure (54.4%); arthritis (49.2%); high lipids (40.5%); hearing loss (35.2%); and chronic pain (28.3%). additionally, about one quarter (23.0%) reported depression or cancers (23.2%). Concerning disabilities, 15.4% reported disability of feet and legs, and another 8.1% had disability of arms and hands. Overall, 20.9% reported having no natural dentition.

Almost all participants (99.4%) self-reported taking medications, with an average of 4.3 medications per person (SD=3.2; range 1-29). No significant differences were present by health conditions or number of medications by sex. However, differences by health conditions and number of medications were significant by age. As age increased there were more health conditions, and more medications were taken. By level of education, those with tertiary education had fewer health conditions than any other education level, and consequently were taken fewer medications. Those with no natural dentition (20.9%) reported an average of 7.6 (SD=3.7) conditions compared to 6.3 (SD=3.6) of those who reported having at some natural teeth ($p<0.001$). Consequently, they also self-

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reported taking more medications (4.8 (SD=3.5). vs. 4.0 (SD=3.1).; p<0.001) the distribution of health conditions among older adults is presented in Table 2.

Table 2. Distribution of health conditions among older adults living in rural Victoria, Australia.

Variables	categories	% [1]
Medical conditions	High blood pressure	54.4
	Arthritis	49.2
	Allergies	32.1
	Chronic pain	28.2
	Depression	23.0
	Diabetes	14.9
	Cardiovascular disease	12.9
	Respiratory disease	21.2
	Cancer	23.2
	Hearing loss	35.2
	Eye problems	93.5
	Disability feet and legs	15.4
	Disability arms and fingers	8.1
Number of medical conditions	None	0.2
	One	5.3
	Two	6.6
	Three	9.4
	Four	10.9
	Five	10.4
	Six	11.6
	Seven or more	46.9

[1] n=1407.

Of particular significance, among the participants who underwent the 2-hour health screening (n=572), a substantial proportion (79.9%) reported taking of at least one medication that had the potential to induce xerostomia (such as antidepressants, antihypertensives, etc.) (See Table 3).

Moreover, in relation to dry mouth, as age increases there was a significantly higher intake of medications that could lead to xerostomia. In addition, by absence or presence of natural dentition, those with no natural dentition had a higher intake of medications (1.46 (SD=1.0) vs 1.20 (SD=0.9; p=0.015). However, there were no differences in the number of medications that may cause dry mouth by sex, by place of residence, or by level of education.

Table 3. Distribution of medication consumption among older adults living in rural Victoria, Australia.

Variables	categories	% [1]
Number of medications	None	0.9
	One	24.2
	Two	19.5
	Three	16.1
	Four	10.9
	Five	10.2

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	Six or more	19.2
Number of medications that may affect xerostomia	None	20.1
	One	44.6
	Two	25.0
	Three or more	10.3

[1] n=572.

Almost two-thirds (65.2%) of participants reported consuming alcohol, with an average intake of 8.1 drinks per week among those who self-reported alcohol consumption. About 1 in 4 (24.9%) of them reported consuming more than 10 standard drinks per week.

Additionally, 9.5% of participants identified as current smokers, with an average of 13.4 cigarettes smoked per day. Among those who reported smoking, the proportions of light smokers (fewer than 10 cigarettes per day) was 25.8%, moderate smokers (10 to 19 cigarettes per day) were 53.1%, and another 21.1% were heavy smokers (20 or more cigarettes per day). Furthermore, 38.1% of participants reported being past smokers. As expected, significant differences by sex were found in both number of drinks per week ($p<0.01$) and number of cigarettes per day ($p<0.05$), with men drinking and smoking larger amounts than women. By location, those living in shire capitals tended to smoke more compared to those living in Shepparton ($p<0.02$). No differences were found by location in level of alcohol consumption.

Beyond these lifestyles, the study also found that the majority of participants (60.2%), were involved in clubs and other social organizations. No differences were observed in community participation by sex, or place of living. By level of education, those with tertiary education tended to have a higher participation than other education groups ($p<0.01$).

4. Discussion

This study examined the demographic characteristics and distribution of common systemic health conditions of a group of adults aged 55 years and older living in rural areas of the Australian state of Victoria. The findings of this study are consistent with previous research on the oral health conditions in rural areas of Victoria [26]. Furthermore, the study aligns with existing evidence that non-communicable diseases are the primary contributors to morbidity and mortality rates in Australia [27]. The study reveals that a majority reported having multiple medical conditions that may affect their oral health. Heart-related diseases, high blood pressure, arthritis, high lipids, visual impairments, hearing loss, chronic pain, and diabetes, and depression were found to be highly prevalent in this sample of older adults.

The assessment also included conditions that may impact oral health care and oral hygiene, including visual impairments (even with the use of corrective eyewear), hearing impairments, and manual dexterity challenges as measured by arm and hand disabilities. Furthermore, findings also report the presence of other disabilities among the participants, which disabilities may affect access to healthcare services. For example, some reported having a disability in their feet and legs. Also, a significant proportion of the participants reported not having all of their natural teeth. Although the absence of natural teeth, or edentulism, is not universally classified as a disability in all contexts [27], it can significantly impact an individual's quality of life, leading to functional impairments that may be recognized as disabling in certain circumstances [28]. For example, functional, or psychological impairments [29].

The majority of participants were taking medications, with an average of 4.3 medication per person. Among them, a large proportion reported taking medications that could cause xerostomia (i.e., dry mouth). For example, 54.4% of the participants reported a positive history of high blood pressure, another 49.3% reported arthritis, which raises concerns for oral healthcare as high blood pressure and arthritis (e.g., **Nonsteroidal Anti-Inflammatory Drugs)** medication are associated with salivary hypofunction and can contribute to dry mouth [23,30,31]. Depression was another health condition observed, and the use of antidepressants can reduce salivary flow and cause dry mouth.

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Depressed individuals also tend to have lower rates of salivary flow even without medication, and untreated depression can lead to neglected oral hygiene and gum disease. Additionally, several over-the-counter medications, such as expectorants and decongestants, can also reduce saliva flow [23]. Interestingly, in the present study, those with no natural teeth (i.e., edentulous) reported more health conditions and higher medication consumption than those who kept some natural teeth.

The prevalence and amount of alcohol consumption and smoking and average number of drinks per week and cigarettes smoked per day were relatively high among (XRoadsII) participants, although not different to the national averages for these age groups [24,25]. Still, present results reinforce the need for targeted interventions to address these risk factors and promote healthier behaviours. Additionally, there is a need for comprehensive oral cancer-related education and screening training for oral health professionals to enhance prevention and early detection of oral cancer [32]. It is also essential to increase the level of confidence among oral health professionals in discussing behavioral issues that may impact oral health, such as smoking and alcohol consumption, with their patients. By addressing these areas, a significant impact can be made on improving oral health outcomes in older adults [32].

The involvement in social activities suggests an acceptable, although lower than the national average (77%) [26], level of community engagement and could indicate strong social support networks and integration into communal life, which are important for health promotion [33,34]. Older adult communities often engage in club activities. Utilizing this 'settings approach' for promoting oral health among older adults aligns well with the WHO Primary Health Care Model and the principles outlined in the Ottawa Charter on Health Promotion [33].

In spite of numerous studies demonstrating the interrelationship between systemic conditions and oral health, there is a notable deficit of knowledge and understanding among healthcare professionals about this connection [35], highlighting a gap between scientific evidence and actual practices. Furthermore, the availability of preventive measures, oral diseases are often underestimated and considered to be inevitable, resulting in increased national and household healthcare expenditures [8]. Individuals with chronic diseases tend to experience a considerably higher burden of oral disease compared to their healthy peers [36]. The integration of oral health into general health programs, particularly targeting older adults, is being advocated [8,37].

This study highlights the importance of knowledge and understanding among healthcare professionals about the connection between oral health and systemic conditions. This leads to underestimation and neglect of oral diseases, resulting in increased healthcare expenditures. Individuals with chronic diseases experience a higher burden of oral disease [35]. Integrating oral health into general health programs, especially for older adults, is advocated [38], but there are limited communication and perception issues. Healthcare professionals often do not inquire about patients' oral health [39]. Bridging the gap between oral and general health can lead to comprehensive care and improved health outcomes for older adults. The challenges in maintaining good oral health include low awareness, lack of motivation, and discomfort [35]. Educating healthcare professionals about the relationship between oral and systemic health is crucial for informed treatment decisions.

Although the results of this study should be interpreted in light of its cross-sectional design, the self-reported nature of the data, and the specific focus on rural areas of the state of Victoria, we believe that the large sample size, use of validated assessment instruments, comprehensive data collection, and the substantial population base provide a significant contribution to the understanding of older Victorians' health. With the ageing population in Australia and other developing nations, particularly in rural areas [40] coupled with robust evidence on the reciprocal links between oral diseases and chronic conditions, it is imperative to implement policies and innovative initiatives to make oral health care services and preventive programs affordable and accessible for this growing demographic.

Moreover, effective oral health education programs are needed to raise awareness about the impact of systemic diseases on oral health, thereby improving health practitioners' clinical decisions. Pharmacists should also be aware of the association between many over-the-counter medications and

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dry mouth. Many countries are grappling with similar issues, making the presentation of current results relevant for further research and planning.

5. Conclusions

Overall, the study provides insights into the demographics, medical conditions, medication use of the older adult population, and lifestyle factors and social engagement of older adults living in rural areas of Victoria. The findings suggest that age, education level, and natural dentition may be associated with different health conditions and medication consumption patterns. More importantly, the study supports the notion that disparities in health begin early in life and persist throughout the lifespan [41]. Individuals with chronic diseases tend to experience a significantly higher burden of oral disease compared to their healthy counterparts [40].

This study emphasizes the need for enhanced education and training for oral health professionals regarding the interplay between oral health and systemic health in order to promote better interdisciplinary collaboration and comprehensive patient care. These findings highlight the fundamental role of oral health professionals, such as dentists, dental hygienists, and oral health therapists, in recognizing and communicating the significant connection between oral health and systemic health to their patients. The findings also offer initial insights into the prevalence of medical conditions and medication usage among older adults in rural Victoria, which may have implications for their oral health. This information can be invaluable for healthcare and dental workforce planning, policy development, and the enhancement of overall well-being in this population.

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Institutional Review Board Statement: The primary study, Crossroad II was conducted in accordance with the Declaration of Helsinki, and the ethics approval was granted by the Goulburn Valley Health Ethics Committee (GVH 20/16).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data will be available on reasonable request using an application form from the Crossroads Chief Investigator (D.S).

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