Original Article

Analysis Of The Influence Of Socioeconomic And Lifestyle Factors On Oral Health: A MICMAC Approach

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Abstract

This study presents a comprehensive analysis of the influence of socioeconomic and lifestyle factors on oral health, using the MICMAC technique to classify these factors into key, determinant, autonomous, and result factors. The research identifies a complex interaction of factors, in which socioeconomic elements such as income and educational level emerge as key influencing factors due to their direct impact on access to dental care and oral hygiene practices. Lifestyle factors, including dietary habits, tobacco use, and alcohol consumption, have been found to have a direct influence on the incidence of oral diseases. The findings emphasize the need for multifaceted approaches to promote oral health, addressing socioeconomic, lifestyle, and cultural aspects. This research provides a valuable foundation for making informed decisions and designing effective oral health strategies aimed at improving quality of life and oral health equity among diverse populations.

Keywords: Oral epidemiology, dental prevention, dental care, health promotion, comprehensive approach to oral health.

Introduction

Oral health (OH), an essential component of general health, has become an area of research and critical attention in public health globally. Preserving optimal OH not only influences patients' quality of life, but also impacts healthcare systems, economic productivity, and social equity (Robinson, et al., 2020). In this context, the analysis and understanding of the factors that impact OH become an undisputed priority for researchers, health professionals, and policymakers. This study aims to address this priority through a comprehensive approach that incorporates a variety of socioeconomic and lifestyle factors and uses the MICMAC technique to classify them into meaningful categories.

The foundation of this study is based on the premise that OH is a multifaceted phenomenon, influenced by interconnected factors that operate in a complex dynamic. OH difficulties, ranging from tooth decay and gum

disease to more serious conditions such as oral cancer, harm a large number of individuals around the globe and carry significant medical, economic, and social consequences (Peres, et al., 2019). These conditions not only cause individual pain and suffering but also exert a substantial economic burden in terms of treatment costs and lost work days due to oral diseases. Additionally, there is an equity dimension in OH given that socioeconomic and cultural disparities are often reflected in the prevalence and severity of dental problems (DP) (Northridge, Kumar, & Kaur, 2020). Lack of access to dental care (DC), as well as inequality in the adoption of oral care practices, exacerbate these disparities.

The present study recognizes that OH is a phenomenon determined by a wide range of factors operating at the individual, community, and societal levels. Socioeconomic factors, such as income, educational level, occupation, and dental insurance coverage, have a direct impact on access to DC and people's ability to maintain appropriate oral care practices (Wallace & MacEntee, 2012). On the other hand, lifestyle factors, such as alcohol and tobacco consumption, and dietary habits, also play an essential role in OH, influencing the incidence of dental diseases. Furthermore, age and genetics give a unique biological dimension to OH, since natural changes in the oral cavity and genetic predispositions can increase the risk of DP.

This study aims to address a pressing need in the field of OH by examining and classifying socioeconomic and lifestyle factors, as well as the influence of culture and traditions on OH. The application of the MICMAC technique offers an innovative and holistic approach to understanding the complicated web of factors that impact OH, providing a solid foundation for making informed decisions and designing effective dental health strategies. The research will provide significant knowledge to promote OH, equity, and improve the quality of life of the population.

Methodology

This study was exploratory and descriptive with a MICMAC (Cross Impact Matrix Multiplied to a Classification) approach, since it focuses on the meticulous empirical observation of events or phenomena in their natural environment, without altering the variables, and does not require active participation by researchers, its objective is to carefully analyze the patterns and relationships between the variables (Sampieri, 2018). The above was considered in order to analyze the impact of socioeconomic and lifestyle factors on OH. Socioeconomic factors were identified such as economic income, educational level, and occupation; lifestyle factors such as eating habits, alcohol consumption, tobacco consumption, and oral hygiene; and biological factors such as genetics and age. Healthcare access factors such as dental insurance coverage, distance to DC centers, and cultural and ethnic factors such as culture and traditions.

As a source of data, those available in the scientific literature and previous studies on the subject were used. These data include research, nationwide surveys, public health statistics, government reports, and OH-related databases. Regarding the analysis, the MICMAC technique was used, which is an analysis mechanism that is used to understand the relationships between variables or factors and how they influence a system or a given scenario (Arango & Cuevas, 2014).

This technique consists of four steps: The first step involves identifying all the relevant variables that can influence a specific system or scenario (Godet, 1986). The next step is to create a matrix that relates all the identified variables. The third step is to classify the relationships between variables based on their dependence and influence. This is done by calculating the product of the corresponding entries in the matrix. If variable A has a significant impact on variable B, then A is considered to be an influential variable for B. In the last step, the variables are divided into four quadrants based on their influence and dependence.

The factors or variables are classified as follows: autonomous or independent variables: here are the variables that have low influence and low dependence on other variables; linking or determinant variables: these variables have high influence, but low dependence, dependent or result variables: they are variables with high

dependence, but low influence; finally, impulse, motor, or key variables: these are the variables with high dependence and high influence (Benjumea-Arias, Castañeda, & Valencia-Aria, 2016).

Based on the above steps, a cross-impact matrix was constructed using data available in the literature and relevant information on socioeconomic, lifestyle, and OH factors. To carry out this task, there was the collaboration of five (5) experts, who contributed to the creation of the MICMAC matrix. With the above, it was possible to classify the factors into four categories based on their influence and mutual dependence, that is, motor, linking, autonomous, and dependent factors.

Results

Next, what was acquired in this research is presented, in which 12 factors were defined through an in-depth review of the literature and interviews with experts who gave their opinions on the socioeconomic and lifestyle factors that impact OH. For the application of the MICMAC technique, the factors obtained with their respective description were coded in a table, which is part of phase I of this technique. First, a number is assigned to each factor, followed by a concise code or label, then the full name of the factor is included, and finally, a brief description is added. As an example, in the following table, identified as 'Table 1', four columns are presented that include the factor number, the code or short name of the factor, the full name of the factor, and its description.

It can be seen in Table 1 that factor number 1 corresponds to the code EI, the name Economic income, and the description: the income level of a person or family can influence their ability to access oral care services and purchase dental hygiene products. In this way, the other elements in the table can be interpreted.

Table 1. Factors selected to apply MICMAC.

#	Code	Factor	Description
Socioeconomic Factors			
1	EI	Economic income	The income level of a person or family can influence their ability to access oral care services and purchase products. of dental hygiene.
2	EL	Educational level	The level of education may be related to the understanding of the relevance of oral hygiene and the adoption of healthy habits.
3	OC	Occupation	The type of job a person does can affect their exposure to OH risks, such as stress or exposure to harmful substances.
Lifestyle factors			
4	EH	Eating habits	Diet, especially the consumption of sugars and highly processed foods can influence OH and the incidence of caries.
5	TC	Tobacco consumption	Tobacco is linked to bad breath, gum disease, and oral cancer.
6	CA	Alcohol consumption	Excessive alcohol consumption could have a detrimental effect on OH.
7	OHY	Oral hygiene	The use of dental floss and mouthwash, and the frequency and quality of tooth brushing, are critical factors in the prevention of DP.
Biological factors			

8	GEN	Genetics	Genetic predisposition can influence OH and susceptibility to dental diseases.
9	AG	Age	Age is related to changes in OH, such as tooth loss or bone resorption.
Health care access factors			
10	DIC	Dental insurance coverage	Access to dental insurance can affect the frequency of visits to the dentist.
11	DDCC	Distance to DC centers	An individual's proximity to a DC facility may influence the frequency of visits.
Cultural and ethnic factors			
12	CT	Culture and traditions	Cultural customs and traditions can influence oral care and dietary practices.

Source: Authors

Once the socioeconomic and lifestyle factors linked to oral health were identified, a collaborative evaluation was carried out in which five (5) experts participated to analyze the relationships of influence and dependence between these factors. The evaluation was carried out through a square matrix, which corresponds to Phase II of the MICMAC technique. Figure 1 shows the matrix of direct influence/dependence, which was completed with the values resulting from the collaboration of the experts.

In Figure 1, it can be seen that the matrix of direct influence/dependence has been filled with values that range between 0 and 3, according to the evaluation carried out by the experts who participated in this study. It can be seen that the influence relationships of the EI factor (Economic income) with the EL factor (Educational level), was determined as a strong relationship with a rating of three (3), with the OC factor (Occupation) the relationship is moderate, as with the EH factor (Eating habits) and the TC factor (Tobacco consumption) with a rating of two (2). In cells where there is a one (1) it means that the relationship is weak and where there is a zero (0) there is no relationship. This is how the direct influence/dependence matrix is interpreted.

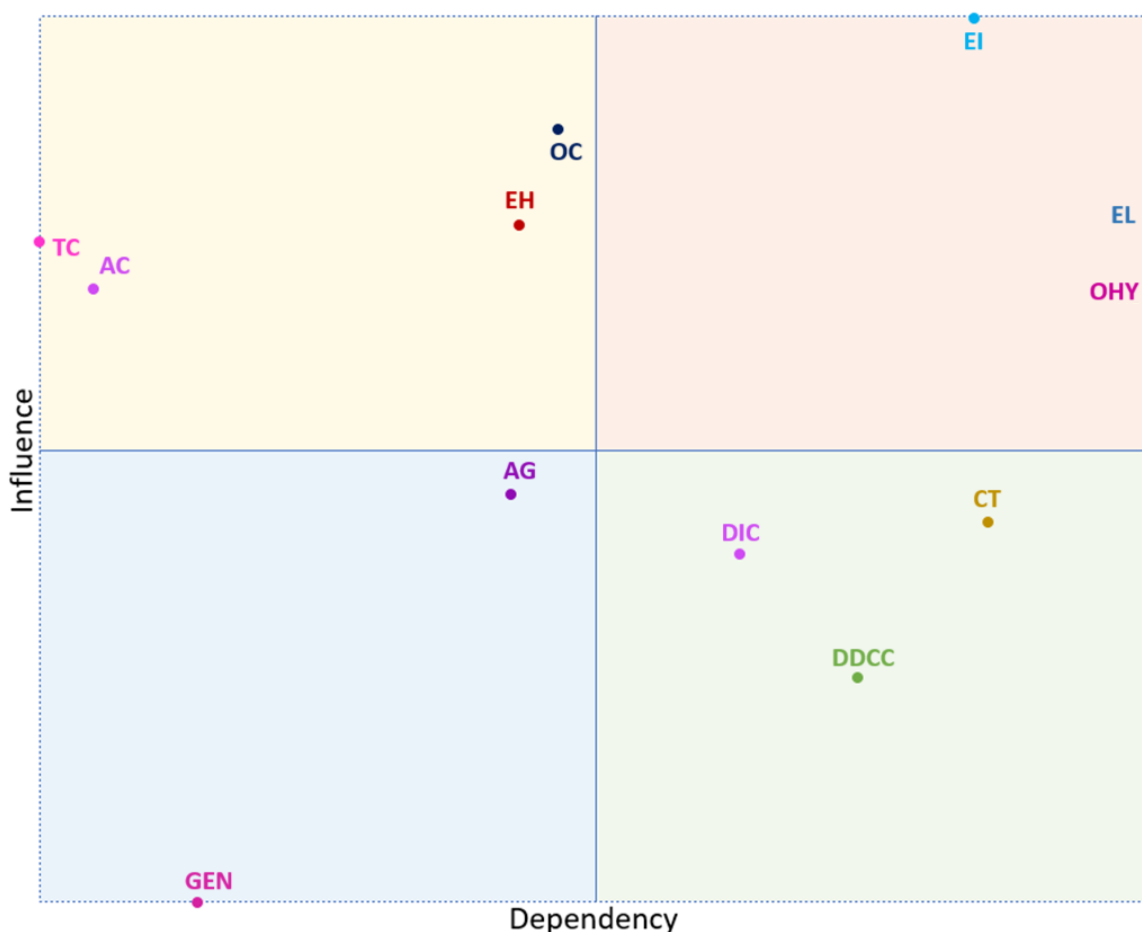
Figure 1. Matrix of direct Influence/dependence

Influence ↱	EI	EL	OC	EH	TC	AC	OHY	GEN	AG	DIC	DDCC	CT
EI	0	3	2	2	2	3	2	0	3	3	3	1
EL	3	0	3	0	0	0	3	0	2	3	2	3
OC	3	3	0	3	0	1	3	0	0	3	3	2
EH	3	3	0	0	0	0	3	2	3	0	2	3
TC	3	2	2	2	0	0	3	3	1	0	0	3
AC	0	3	2	0	0	0	2	3	2	0	3	3
OHY	3	3	0	1	1	1	0	0	1	1	3	3
GEN	1	2	0	0	0	0	1	0	0	0	0	0
AG	2	2	2	3	0	0	2	0	0	2	0	0
DIC	2	0	2	0	0	0	0	0	1	0	3	3
DDCC	1	1	1	0	0	0	2	0	0	3	0	0
CT	0	2	0	2	2	1	3	0	0	2	0	0

Source: Authors

Once the matrix was filled with all its values, the classification and therefore the location of each factor in one of the four quadrants of the direct influence/dependence plane presented below in Figure 2 was obtained. The structural analysis revealed the presence of three motor factors (keys), which are located in the first quadrant (upper right corner). These factors are the following: EI (Economic income), EL (Educational level), and OHY (Oral Hygiene). In the second quadrant (upper left corner), four linking factors (determinants) were identified: OC (Occupation), EH (Eating habits), CA (Alcohol Consumption), and TC (Tobacco Consumption). In the third quadrant (lower left corner), two factors that were considered autonomous were located: AG (Age) and GEN (Genetics). Finally, in the fourth quadrant (lower right corner), three factors were classified as dependent or result: CT (Culture and traditions), DIC (Dental Insurance Coverage), and DDCC (Distance to Dental Care Centers).

Figure 2. Plane of direct influence/depencence



Source: Authors

Table 2 below shows the classification of the factors obtained from the matrix of direct influence.

Table 2. Classification of factors by indirect influences and dependencies

Type of factors	Factors	Code
Key, strategic or challenge factors	Economic income	EI
	Educational level	EL
	Oral hygiene	OHY
Determining or "influencing" factors	Occupation	OC
	Eating habits	EH
	Tobacco consumption	TC
	alcohol consumption	CA
Autonomous or independent factors	Age	AG
	Genetics	GEN
Dependent or result factors	Dental insurance coverage	DIC
	Distance to DC centers	DDCC
	Culture and traditions	CT

Source: Authors

As can be seen in the table, one of the key or motor factors was the EI (Economic income). This result may be because economic income has an important influence and multiple connections on people's OH, for example, they significantly influence a person's ability to access oral care services, purchase dental hygiene products, and maintain proper OH habits. According to Northridge, Kumar, & Kaur (2020), people with higher incomes typically have a greater ability to access quality dental healthcare services. This includes regular visits to the dentist, which is essential for early detection and prevention of PD. Similarly, Bakir, Çitaker, & Bakir (2021) observed that this group of people is in a better position to purchase dental hygiene products, such as quality toothbrushes, toothpaste, and mouthwash, which contributes to a better OHY.

Regarding the factor EL (Educational level), it is essential, since it is related to the understanding of the relevance of OHY and the adoption of healthy habits. That is, people with a higher educational level tend to have greater knowledge about the relevance of OH, better understand dental hygiene practices, and are more aware of the risks of not taking proper care of their OH. This awareness is essential to adopting effective oral care habits. In this regard, in (Palati, et al., 2020), it was observed that education provides people with the knowledge and skills required to practice effective OHY exercises, such as proper brushing, flossing, and choosing proper dental hygiene products.

Finally, the factor OHY (Oral Hygiene) is a key factor, since it directly affects OH and is essential to prevent DP. Studies such as (Al-Qahtani, Razak, & Khan, 2020) demonstrate that OHY, which includes practices such as regular brushing, use of mouthwash, and flossing, is a key factor in the prevention of DP such as periodontal diseases and cavities. It is evident that maintaining good OHY is essential to eliminate food residues and plaque that can cause DP, and it is also relevant to prevent common oral diseases. Consistent brushing and flossing help remove plaque and bacteria buildup, reducing the risk of gum disease, cavities, and other oral problems.

Regarding the factors that were classified as determinants, there is OC (Occupation). The occupation or the type of work that a person does was classified as a determinant because it can influence the OH in several ways. For example, people with jobs that involve high levels of stress may be more prone to OH problems, such as bruxism. According to Kaur & Nain (2019), people with jobs that involve high levels of stress may be more prone to bruxism (teeth grinding), which can damage teeth and gums. Additionally, some occupations may expose people to substances or conditions that may affect their OH. Likewise, people with irregular or stressful work schedules may have difficulty maintaining a good oral care routine. However, people with jobs that offer dental insurance may have an advantage in terms of access to dental services.

Another factor that was a determining factor was EH (Eating habits). This is because diet influences OH and caries incidence, but can be influenced by other key factors. According to Giacaman (2018), foods rich in carbohydrates and sugars can feed the bacteria that cause cavities. Eating habits, such as frequent consumption of sugary foods or carbonated drinks, can increase the risk of tooth decay, and some acidic foods, such as citrus fruits, can erode tooth enamel over time. In this sense, a balanced diet rich in nutrients is essential to maintain healthy gums and teeth. Eating habits that lack certain nutrients, such as calcium and vitamin C, can increase the risk of gum disease and other oral problems.

On the other hand, the factor TC (Tobacco Consumption) was found to be a determining factor because it is related to gum disease and oral cancer, but it can also be influenced by other key factors, such as income and education. Tobacco consumption has a direct and significant impact on OH and is a determining factor in the incidence of a variety of PD, including oral cancer and gum diseases. According to Agbor & Jupkwo (2020), tobacco consumption, whether through cigarettes, cigars, or smokeless tobacco, is related to a series of PD, including bad breath, increased tartar and plaque, discoloration of teeth, and gum disease. On the other hand, tobacco consumption is one of the main risk factors for oral cancer, which includes cancer of the mouth, tongue, lips, and throat.

Similar to tobacco consumption, the other determining factor was AC (Alcohol Consumption) this is a determining factor that influences OH, but can be influenced by other key factors, such as education and income. According to Fahad, Mohamed, & Layedh (2020), alcohol is an irritant to oral tissues and can contribute to problems such as dry mouth, which can increase the risk of tooth decay. Individuals who consume excessive amounts of alcoholic beverages may be less likely to maintain good OHY, which includes regular brushing and flossing. On the other hand, Bilbilova (2020) points out that alcohol can reduce the flow of saliva in the mouth, which increases the risk of dental cavities, given that saliva contributes to the neutralization of acids and the cleaning of bacteria and mouth food residue.

As for the factors that were autonomous, AG (age) is classified as an autonomous factor in this study due to its influence on natural changes in OH, the specific risks of age, the changing needs of DC, biological and genetic factors related to the age, and differences in oral care habits throughout life. While age can be influenced by other factors, its effects on OH are largely independent and have an important impact on OH throughout the life cycle. According to Al-Nasser & Lamste (2020), DC needs can change significantly throughout life. The oral care that is necessary in childhood may differ from that which is essential in adulthood or in old age. Age influences care needs and is therefore considered an autonomous factor.

The other autonomous factor was GEN (Genetics), genetic predisposition is an autonomous factor since, although it influences OH, it is largely independent of other socioeconomic or lifestyle factors. According to Vieira (2019), genetic factors are inherently related to a person's biology and heredity, and their impact on OH is independent of other external factors. Taking into account the above, genetics acts independently of other socioeconomic and lifestyle factors, such as income, education, or eating habits. Even a person with proper oral care habits can face OH challenges due to genetic predispositions.

Finally, among the factors classified as results is DIC (Dental insurance coverage). Dental insurance coverage is classified as an outcome factor, as its presence or absence may depend on other key factors, such as income and educational level. Additionally, dental insurance coverage has a direct impact on access to DC and, ultimately, on OH outcomes. In (Uguru, et al., 2020), it was noted that the presence of dental insurance can significantly improve access to dental healthcare services, which in turn influences a person's ability to receive preventive care, and treatments when necessary.

Another factor classified as result was DDCC (Distance to DC centers). Distance to DC centers is considered a result factor because it has a direct impact on access to DC and, ultimately, on OH outcomes. Geographic and access barriers to DC can have a negative effect on DP treatment and prevention, influencing OH outcomes in

a population. According to Al-Nasser & Lamster (2020), the distance to DC centers may be related to the availability of dental services, which in turn depends on factors such as geographic location. Individuals living far from DC centers may face a higher prevalence of untreated DP, which negatively affects their OH.

The last factor classified as results was CT (Culture and traditions). Culture and traditions are considered result factors as they influence oral care practices, but they may be the result of key factors such as education and income. According to Due, Aldam, & Ziersch (2020), cultural differences can affect the adoption of DC practices, treatment seeking, and ultimately OH outcomes in specific communities. Understanding and addressing these cultural influences is essential to improving OH care and outcomes in diverse populations.

As seen in the results of this study, key, determinants, autonomous, and result factors were identified in relation to OH. By identifying and classifying the key, determinant, autonomous, and result factors that affect OH, this study provides a solid foundation for planning and implementing effective OH programs. Furthermore, it recognizes the complexity of the interaction of socioeconomic and cultural factors in OH, highlighting the need for interdisciplinary approaches that consider these variables.

Conclusions

In the course of this research, the factors that influence OH have been identified and classified, using a methodology based on the MICMAC technique. This approach allowed for a deeper understanding of the interdependence of socioeconomic and lifestyle factors, as well as the influence of traditions and culture on the OH the people.

The findings highlight the interdependence of key factors, such as economic income and educational level, and the importance of determinants, including eating habits, tobacco consumption, and alcohol consumption, in OH. Age and genetics were identified as autonomous factors, and dental insurance coverage, distance to DC centers, and cultural influences emerged as outcome factors. The conclusions highlight the need for multifaceted approaches in promoting OH, taking into account socioeconomic, lifestyle, and cultural aspects. However, it is recognized that this study has limitations, including the lack of quantitative assessment of the influence of factors and reliance on secondary data, as well as cultural variability not explored in depth.

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