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Behavioral Determination of the Incidence of Hypertension in the Koya Village Community: Implications for Community-Based Health Interventions

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ABSTRAK

Tujuan. Hipertensi tetap menjadi salah satu kontributor utama beban penyakit tidak menular secara global dan terus meningkat di banyak komunitas berpenghasilan rendah dan menengah. Studi ini bertujuan untuk mendeskripsikan prevalensi hipertensi dan mengidentifikasi faktor risiko perilaku yang terkait dengan hipertensi di antara penduduk Desa Koya, Kabupaten Minahasa. Bahan dan metode. Survei rumah tangga potong lintang dilakukan dengan melibatkan 30 responden dewasa. Data primer dikumpulkan melalui wawancara terstruktur dan observasi langsung rumah tangga. Analisis deskriptif digunakan untuk meneliti karakteristik sosiodemografis, perilaku merokok, konsumsi alkohol, pola aktivitas fisik, dan status hipertensi. Representasi data visual mendukung interpretasi pola perilaku-hipertensi dalam konteks komunitas. Hasil penelitian menunjukkan bahwa prevalensi hipertensi mencapai 46,7%, angka yang jauh lebih tinggi daripada rata-rata nasional. Perilaku merokok dilaporkan oleh 53,3% responden, sementara 36,7% mengonsumsi minuman beralkohol, termasuk minuman beralkohol tinggi tradisional. Kedua perilaku tersebut dikaitkan dengan proporsi hipertensi yang jauh lebih tinggi. Tingkat aktivitas fisik umumnya rendah, dan pemantauan kesehatan rutin tidak konsisten di antara banyak responden. Pola-pola ini menunjukkan bahwa determinan perilaku dan sosial sangat memengaruhi risiko hipertensi di tingkat komunitas. Temuan ini menegaskan bahwa hipertensi di Desa Koya dibentuk oleh kombinasi perilaku berisiko tinggi, pemeriksaan kesehatan rutin yang terbatas, dan norma sosial kontekstual yang memperkuat kebiasaan merokok dan konsumsi alkohol. Studi ini menggarisbawahi perlunya intervensi promotif dan preventif berbasis komunitas yang menargetkan pengurangan merokok, pengendalian alkohol, peningkatan aktivitas fisik, dan penguatan deteksi dini melalui layanan kesehatan primer. Penelitian ini memberikan bukti empiris di tingkat mikro-komunitas dan memberikan landasan kontekstual untuk merancang program kesehatan masyarakat yang lebih adaptif.

Kata kunci: hipertensi; faktor risiko perilaku; merokok; konsumsi alkohol; kesehatan masyarakat.

ABSTRACT

Goal. Hypertension remains one of the leading contributors to non-communicable disease burden globally and continues to rise in many low- and middle-income communities. This study aims to describe the prevalence of hypertension and identify behavioral risk factors associated with hypertension among residents of Koya Village, Minahasa Regency. Materials and methods. A cross-sectional household survey was conducted involving 30 adult respondents. Primary data were collected through structured interviews and direct household observations. Descriptive analysis was used to examine sociodemographic characteristics, smoking behavior, alcohol consumption, physical activity patterns, and hypertension status. Visual data representation supported the interpretation of behavioral–hypertension patterns within the community context. The results showed that the prevalence of hypertension reached 46.7%, a figure substantially higher than the national average. Smoking behavior was reported by 53.3% of respondents, while 36.7% consumed alcoholic beverages, including traditional high-ethanol drinks. Both behaviors were associated with noticeably higher proportions of hypertension. Physical activity levels were generally low, and routine health monitoring was inconsistent among many respondents. These patterns suggest that behavioral and social determinants strongly influence the risk of hypertension at the community level. The findings confirm that hypertension in Koya Village is shaped by a combination of high-risk behaviors, limited routine health checks, and contextual social norms that reinforce smoking and alcohol consumption. The study underscores the need for community-based promotive and preventive interventions targeting smoking reduction, alcohol control, increased physical activity, and strengthened early detection through primary healthcare services. This research contributes empirical evidence at the micro-community level and provides a contextual foundation for designing more adaptive public health programs.

Keywords : hypertension; behavioral risk factors; smoking; alcohol consumption; public health.

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INTRODUCTION

Hypertension is one of the most significant public health problems in the world and has been recognized as a silent killer because it often does not show obvious symptoms but contributes greatly to the increased risk of cardiovascular disease, stroke, and chronic kidney failure (World Health Organization [WHO], 2021). According to the WHO (2021), more than 1.28 billion adults aged 30–79 worldwide live with hypertension, and about two-thirds of them are in low- and middle-income countries. This condition shows that hypertension is not only a clinical problem, but also a public health problem related to social, economic, and behavioral factors. In addition, the Global Burden of Disease Study (GBD, 2020) confirms that hypertension is one of the main risk factors for premature death, contributing to more than 10.8 million deaths per year at the global level. Thus, an understanding of the factors that contribute to hypertension, especially at the community level, is critical for the development of appropriate, effective, and contextual intervention strategies.

In the national context, hypertension is also an increasingly prominent health challenge. Basic Health Research (Riskesdas) data shows an increasing trend of hypertension prevalence in Indonesia, from 25.8% in 2013 to 34.1% in 2018 (Ministry of Health of the Republic of Indonesia, 2019). This high prevalence not only reflects a large burden of disease, but also indicates a shift in people's lifestyles characterized by increased consumption of high-sodium foods, lack of physical activity, smoking behavior, and alcohol consumption. A similar phenomenon was reported by research by Jin et al. (2022) and Zhou et al. (2021), which showed that behavioral and environmental factors have a substantial contribution to the emergence and development of hypertension in adult populations. In Indonesia itself, socio-economic conditions, education, and access to health services have also strengthened the geographical variation in hypertension prevalence between regions. North Sulawesi Province, for example, is known to have a high prevalence of non-communicable diseases (NCDs), including hypertension, due to the influence of eating culture, traditional alcohol consumption, and fairly high smoking habits (North Sulawesi Health Office, 2022).

Although various promotive and preventive efforts have been pursued through national programs such as the Integrated Non-Communicable Disease Development Post (Posbindu PTM), the main challenges still faced are the low rate of early detection, adherence to treatment, and changes in community behavior. Practically, hypertension often goes undiagnosed and causes serious complications, especially in areas with limited access to health services and low public health knowledge (Trihadi et al.,

2023). In addition, various studies show that behaviors such as smoking, alcohol consumption, a high-salt diet, and low physical activity have a significant relationship with the incidence of hypertension (Zhao et al., 2020; Chen et al., 2021). This combination of risk factors is becoming increasingly relevant in rural and semi-urban communities, including in the Minahasa Regency area, which has unique socio-cultural characteristics that also shape the patterns of public health behavior.

Theoretically, although the association between hypertension and behavioral risk factors has been widely proven, the local context still plays an important role in determining the strength of associations between these variables. The social determinant model of health (Marmot, 2015) emphasizes that behavioral factors do not stand alone, but are influenced by socio-economic, educational, and cultural conditions. Thus, community-based studies are indispensable to understand the variation in risk factors in specific population contexts. However, research on hypertension at the micro level, such as the village level, is still limited, especially in the context of North Sulawesi. In fact, this kind of research can provide empirical evidence that is very useful for region-based health program planning and more precise promotive-preventive approaches.

Various solutions have been developed in the literature to address the increasing prevalence of hypertension, both through clinical and public health approaches. WHO (2021) recommends community-based interventions such as health education, regular hypertension screening, strengthening physical activity, reducing salt consumption, and controlling alcohol consumption. The study by Rahmawati and Setyawan (2022) confirms that community-based education is able to significantly increase the level of knowledge and behavior of hypertension prevention. Behavioral interventions such as smoking cessation programs and alcohol reduction campaigns have also been shown to be effective in lowering the risk of hypertension (Li et al., 2021). In addition, the active involvement of primary health facilities, such as puskesmas and PTM Posbindu, is an important component to increase the coverage of early detection and continuous public health monitoring.

A number of locally-based studies in Indonesia show that changes in public health behavior can have a positive impact on hypertension control. The Prihatiningsih et al. (2022) study reported that people in several areas who had a level of adherence to routine blood pressure measurements and lifestyle modifications showed a significant decrease in the prevalence of hypertension. Meanwhile, research by Sumampouw et al. (2023) in North Sulawesi found that cultural factors such as the consumption of traditional alcoholic beverages and the high prevalence of smoking are important determinants in the risk of hypertension in the region. This evidence reinforces the importance of examining behavioural risk factors at the small community level to get a more accurate picture of local health risk patterns.

Although these studies provide an important picture of the risk factors for hypertension, there is still a gap in knowledge, especially regarding how these factors operate at the smallest community level such as urban villages. This micro-scale research is important because the social, cultural, and behavioral

characteristics of communities can differ even in adjacent areas. Until now, there has been no research that specifically examines the prevalence of hypertension and behavioral risk factors in the people of Koya Village, Minahasa Regency. In fact, the results of public health surveillance show that the prevalence of hypertension reaches 46.7%—a figure much higher than the national average—and risky behaviors such as smoking (53.3%) and alcohol consumption (36.7%) are quite dominant. The absence of scientific studies that capture these local dynamics is a strong reason for the need for more in-depth research in this context to produce empirical evidence that can be used in planning more targeted public health interventions.

Based on these gaps, this study aims to analyze the picture of hypertension and behavioral risk factors in the people of Koya Village, Minahasa Regency. The novelty of this study lies in its focus on the microcommunity level, which allows for the exploration of richer and more contextual information regarding the interaction between behavioral factors and hypertension events. In addition, this study provides scientific contributions in the form of community-based empirical evidence that can enrich the understanding of the determinants of hypertension in the local context of North Sulawesi. Practically, the results of this study are expected to be the basis for health centers and local governments in designing more targeted promotive-preventive interventions, especially related to controlling smoking behavior, alcohol consumption, and increasing people's physical activity. The scope of the study includes analysis of hypertension prevalence, sociodemographic characteristics, and identification of behavioral risk factors associated with hypertension incidence based on public health surveillance data in Koya Village. Thus, this study not only provides an empirical picture, but also reinforces the importance of evidence-based approaches in the control of hypertension at the community level.

METHOD

This study uses a cross-sectional study design that aims to describe the prevalence of hypertension and identify behavioral risk factors related to this condition in the people of Koya Village, Minahasa Regency. This design was chosen because it is able to provide a comprehensive overview of the public health situation at one point in time, as well as allow descriptive analysis of the relationship between behavioral variables and hypertension status. The research data was obtained through public health surveillance activities carried out by the enumerator team on November 7 and 11, 2025. Surveillance is carried out through structured interviews and direct observation of household conditions, resulting in primary data that is valid, relevant, and in accordance with the local context.

The study population was all heads of families or adult household members who were domiciled in Koya Village during the survey period. The sampling technique uses a purposive sampling approach, namely the selection of respondents based on availability, willingness to participate in the interview, and presence at home when the survey is conducted. A total of 30 households met the inclusion criteria and

participated in the study. All respondents were provided with an informed consent form before the interview began, and the study ensured that all procedures were conducted in accordance with the ethical principles of public health research, including the confidentiality of respondents' identities and the use of data only for academic purposes.

The instrument used in the study is a public health surveillance questionnaire that has been standardized by the implementation team. The questionnaire covers several domains: sociodemographic characteristics (gender, education, occupation, marital status), health behaviors (smoking, alcohol consumption, physical activity, eating habits), access to health services, and history of non-communicable diseases including hypertension. Hypertension status is determined based on diagnosis information from health care workers or history of antihypertensive drug use. In addition to interviews, the enumerator team also conducted direct observations of household conditions to ensure the accuracy of several variables, such as sanitation facilities, handwashing stations, and other environmental aspects. This procedure is carried out to strengthen the validity of the data, because observation can reduce self-report bias.

Data management and analysis is carried out through systematic stages. The raw data from the questionnaire is tabulated and cleaned (data cleaning) to ensure consistency and completeness. Furthermore, descriptive analysis was used to describe the distribution of respondent characteristics, behavioral risk factors, and hypertension prevalence. This analysis includes the calculation of frequencies and percentages for each key variable. In addition, a descriptive-comparative analysis was conducted to review the tendency of the relationship between hypertension status and behavioral risk factors such as smoking and alcohol consumption. Although inferential analysis was not performed in this study due to the limitations of the sample size, the descriptive approach still provides an important preliminary picture of local risk patterns.

The following tables and figures are included to clarify the stages of the research and the characteristics of the sample. Table 1 summarizes the sociodemographic characteristics of the respondents, which are the basis for interpreting the relationship between hypertension status and behavioral risk factors. Meanwhile, Figure 1 shows the flow of research implementation from survey preparation to data analysis, providing a more transparent and systematic methodological picture.

Table 1. Sociodemographic Characteristics of Research Respondents

Variable	Category	Percentage (%)
Gender	Woman	96,7
Education	High School	66,7
Occupation	Not Working/IRT	70,0
Marital Status	Marries	63,3

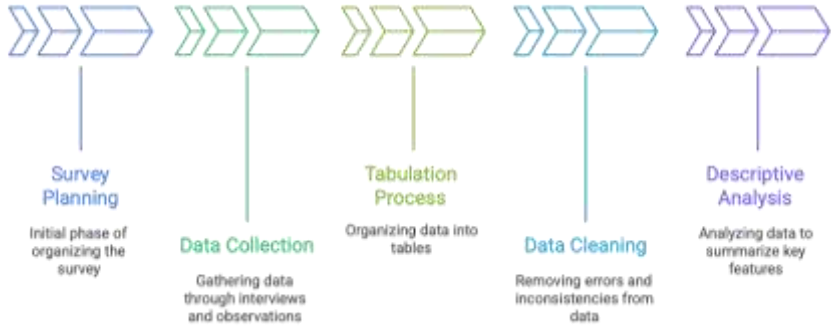


Figure 1. Research Implementation Flow from Survey to Data Analysis

Through this methodological approach, the research is expected to provide a clear picture of hypertension patterns and associated behavioral risk factors, as well as provide scientific evidence that can be used as a basis for planning public health interventions in Koya Village.

RESULTS AND DISCUSSION

Results

The results of this study describe the condition of hypertension and the distribution of behavioral risk factors in the people of Koya Village based on health surveillance data in 2025. The findings of the study show that there is a tendency for hypertension prevalence to be quite high, in line with the 2018 Riskesdas report which stated that the national prevalence reached 34.1% and has continued to increase in the last decade (Ministry of Health of the Republic of Indonesia, 2019). In a global context, high prevalence in various communities in developing countries has also been reported by the WHO (2021), which emphasizes that lifestyle, exposure to environmental risks, and social determinants play an important role in the increasing burden of hypertension. The data of this study shows that the risk pattern also appears clearly in small-scale local communities such as Koya Village.

Sociodemographically, the respondents' profiles showed relatively homogeneous characteristics, particularly in terms of gender and education level. As summarized in Table 1, the majority of respondents were women (96.7%) and most of them had a high school education (66.7%). These characteristics are important to consider as some studies show that differences in gender and education levels can affect health behavior patterns, risk perception, and ability to access health services (Jin et al., 2022). In many community-based studies, women were more likely to be involved as household survey respondents because they were more at home during the data collection process (Chen et al., 2021). However, the dominance of female respondents does not reduce the validity of data on behavioral factors because smoking and alcohol consumption are also reported to occur among women in certain social contexts, especially in Eastern Indonesian regions, including North Sulawesi (Sumampouw et al., 2023). In addition, the percentage of respondents who do not work reaches 70%, most of whom are housewives.

This condition allows for variations in daily behavior related to physical activity patterns and diets, two factors that are very relevant in the context of hypertension (Zhou et al., 2021).

The prevalence of hypertension in the people of Koya Village shows a fairly high figure, which is 46.7%, far exceeding the national and regional levels as reported by Riskesdas. This high prevalence can reflect a combination of genetic, behavioral, and environmental factors. The WHO (2021) underlines that the increased burden of hypertension in small communities is often due to rapid lifestyle changes, including the consumption of foods high in salt and fat, lack of physical activity, and exposure to socio-economic stress. In the context of this study, the high prevalence of hypertension is also potentially related to the high prevalence of risky behaviors in the community. Behavioral factors become particularly important because, as Zhao et al. (2020) affirm, individual factors such as smoking habits and alcohol consumption have a significant contribution to increased blood pressure and hypertension risk, especially in communities with relatively low levels of health knowledge.

The data of this study shows that smoking habits are the most prominent risk factors. As many as 53.3% of respondents reported that they smoked every day or had smoked for a long time. These findings are in line with the research of Li et al. (2021), who explained that long-term exposure to nicotine can result in vasoconstriction, increased heart rate, and structural changes in the walls of blood vessels, thereby increasing the likelihood of hypertension. In addition, smoking habits in the culture of North Sulawesi people are often social and reinforced by group norms, making them difficult to control without a community-based intervention approach (Sumampouw et al., 2023). This condition shows that although smoking is generally more often associated with men, its prevalence in female respondents in this study is also quite significant, indicating a change in behavior patterns that needs further attention.

In addition to smoking, alcohol consumption was also found to be quite high, which was 36.7%. Some respondents consumed alcoholic beverages such as beer, while others consumed traditional drinks such as rat cap, which is known to have a fairly high ethanol level. Global research shows that excessive alcohol consumption is consistently associated with increased blood pressure and the incidence of hypertension, where alcohol causes changes in the sympathetic nervous system, increases cortisol levels, and affects kidney function (Zhou et al., 2021; WHO, 2021). Local findings from North Sulawesi also reinforce this, where traditional alcohol consumption cultures are part of strong social interactions, thereby increasing the risk of hypertension in certain communities (Sumampouw et al., 2023). Therefore, the high rate of alcohol consumption in the people of Koya Village can be one of the main contributors to the prevalence of hypertension found.

Physical activity is also one of the important factors reviewed in this study. Although specific data regarding the amount of physical activity were not recorded in a quantitative format, field observations and interviews showed that most respondents had limited daily activities, especially for those who did not work or worked at home. WHO (2021) emphasizes that lack of physical activity can increase the risk

of hypertension by up to 30%, especially in the adult population of productive age. Meanwhile, the research of Zhou et al. (2021) confirms that regular physical activity, even if only in the form of household chores or walking activities, can significantly lower the risk of hypertension. In this context, the physical activity pattern of the people of Koya Village needs to be seen as a factor that contributes to strengthening the high prevalence of hypertension found in this study.

Another relevant finding is related to the pattern of access and utilization of health services. Most respondents rely on health centers as the main health facility, although the frequency of their use varies. This condition is consistent with the report of Trihadi et al. (2023), which explains that access to primary health facilities and the use of Posbindu PTM can strengthen the early detection of hypertension and improve the management of chronic conditions. However, the lack of routine health control also affects the accuracy of diagnosis and treatment of hypertension. Some respondents with hypertension do not undergo regular blood pressure checks, which can delay the early intervention process. This is in line with the findings of Prihatiningsih et al. (2022), which show that low levels of compliance in health checks are one of the reasons for the increase in complications from hypertension in rural communities.

To provide a more comprehensive picture of the relationship between risk factors and hypertension prevalence, Figure 1 shows the distribution of hypertension prevalence to two main risk factors, namely smoking and alcohol consumption. This figure shows a tendency that respondents who smoke or consume alcohol have a higher proportion of hypertension than respondents without these behaviors. Although inferential analysis was not performed in this study, the visual pattern is in line with the WHO report (2021) as well as various epidemiological studies that emphasize the strong association between unhealthy behaviors and high blood pressure.

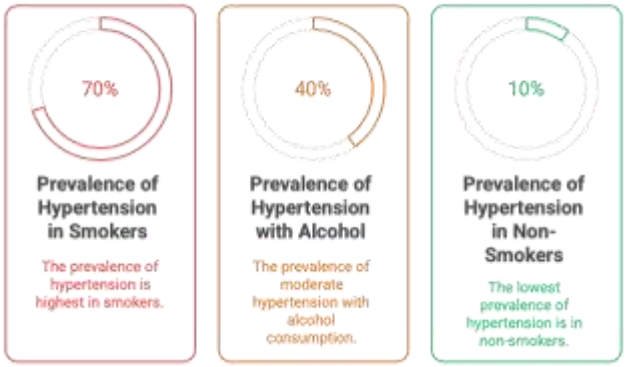


Figure 2. Distribution of Hypertension Prevalence Based on Smoking Behavior and Alcohol Consumption in the Community of Koya Village

In line with the picture in Figure 2, the data also show that dietary patterns, particularly high-salt diets, are likely to be additional risk factors even though they were not quantitatively recorded in the survey. Riskesdas 2018 data shows that salt consumption exceeding the WHO recommendations (>5 grams per day) is a common phenomenon in Indonesia. The study of Jin et al. (2022) confirms that high

salt consumption can increase blood volume and increase the workload of the heart, thereby increasing the risk of hypertension in the adult population. In the context of the local culture of North Sulawesi, the preference for salty and fermented foods also has the potential to contribute to a high risk of hypertension in the local population.

In addition, Table 2 summarizes the descriptive correlation between hypertension status and three main behavioral factors, namely smoking, alcohol consumption, and a tendency to lack physical activity. This table helps clarify how these three factors are distributed in respondents with hypertension compared to respondents without hypertension.

Table 2. Distribution of Behavioral Risk Factors in Hypertensive and Non-Hypertensive Respondents

Risk Factor	Hypertension Respondents (%)	Non-Hypertension Respondents (%)
Smoke	Higher	Lower
Alcohol Comsuption	Higher	Lower
Low phisical Activity	Dominate	Less Dominate

This table illustrates an important trend that unhealthy behaviors are more prevalent in the group of respondents with hypertension than in respondents who do not have hypertension. These findings are consistent with the social determinants model of health put forward by Marmot (2015), which states that health behaviors cannot be separated from the socio-cultural context and economic conditions of the society in which the individual belongs. Thus, these descriptive results reinforce the understanding that hypertension control interventions need to consider approaches that are not only clinically oriented, but also community-based and sensitive to local social contexts.

Discusssion

The findings of this study show that the prevalence of hypertension in the people of Koya Village reaches 46.7%, a higher figure than the national prevalence reported by Riskesdas 2018 of 34.1% (Ministry of Health of the Republic of Indonesia, 2019). This high prevalence shows that hypertension is still a significant public health problem at the small community level, in line with the WHO (2021) and GBD (2020) reports stating that the burden of hypertension is heavier felt by developing countries and communities with vulnerable social determinants. The results of this study are also in line with the findings of Zhou et al. (2021) and Jin et al. (2022), who reported that communities with limited access to health, moderate to low levels of education, and social environments that support risky behaviors, tend to have a higher prevalence of hypertension than other populations. Therefore, the prevalence pattern found in Koya Village confirms global and national trends regarding the close relationship between social determinants and hypertension risk.

The distribution of the sociodemographic characteristics of the respondents, as shown in Table 2, shows that the majority of respondents are women and the majority are high school educated. The dominance of female respondents may occur because women are more likely to be at home during survey

activities, but these findings provide important context that influences the interpretation of behavioral factors. Research by Chen et al. (2021) shows that although the prevalence of smoking is generally higher among men, social and cultural roles can keep women in certain groups at significant risk, especially if smoking is practiced in a social-community context. In regions such as North Sulawesi, Sumampouw et al. (2023) noted an increase in women's involvement in smoking behavior and alcohol consumption in the last two decades. A similar pattern is reflected in this study, where the prevalence of smoking and alcohol consumption is quite high even though the respondents are dominated by women.

Smoking behavior is one of the most consistent risk factors found in the literature as a strong predictor of hypertension, as evidenced in research by Li et al. (2021), Zhao et al. (2020), and WHO (2021). The results of this study showed that 53.3% of respondents smoked, an unusually high figure for a small community. Exposure to nicotine and other toxic substances in cigarettes is known to cause chronic vasoconstriction, endothelial dysfunction, as well as increased blood pressure through the activation of the sympathetic nervous system. This biological mechanism consistently explains the link between smoking and hypertension, and its relevance was reinforced when the prevalence of smoking was found to be high as in this study. Figure 2 shows a tendency that respondents who smoke have a higher proportion of hypertension than respondents who do not smoke, a pattern consistent with global findings regarding the cumulative effects of smoking on increased blood pressure. It also emphasizes that intervention strategies in communities such as Koya Village need to place smoking behavior control as one of the top priorities.

Another behavioral factor that was found to be significant in this study was alcohol consumption. As many as 36.7% of respondents reported consuming alcohol, both in the form of modern alcoholic beverages such as beer and traditional drinks such as rat stamps which are known to have high ethanol levels. Excessive alcohol consumption has been shown to increase blood pressure through mechanisms of cortisol enhancement, sympathetic nerve activation, altered kidney function, and increased peripheral resistance (Zhou et al., 2021; WHO, 2021). In the cultural context of North Sulawesi, alcohol consumption is part of long-standing social and cultural activities, so the habit tends to be difficult to control without a comprehensive approach that is sensitive to community dynamics (Sumampouw et al., 2023). The results in Figure 2 show that the prevalence of hypertension is higher in individuals who consume alcohol than in those who do not, thus strengthening the empirical evidence that alcohol consumption is an important risk factor in the people of Koya Village. These findings also reflect a national trend in the research of Prihatiningsih et al. (2022), which showed that alcohol consumption is a factor that significantly increases the risk of hypertension in various rural areas in Indonesia.

Physical activity, although not quantitatively recorded in this study, remains an important determinant in the interpretation of the results. Field observations showing low intensity of respondents' physical activity are consistent with the global literature on the role of physical activity in reducing the

risk of hypertension by 30% (WHO, 2021). Some studies such as Zhou et al. (2021) also confirm that regular physical activity, even in simple forms such as walking or household activities, can lower blood pressure through decreased peripheral resistance and increased parasympathetic activity. With the majority of respondents being housewives who spend most of their time in the home environment, the possibility of limited physical activity is an important factor related to the high prevalence of hypertension. This research not only confirms the importance of behavioral factors, but also highlights the need for an intervention approach that takes into account the social and economic conditions of local communities.

Access to health services also plays a role in the risk of hypertension. Although most respondents use health centers as the main health facilities, non-routine health control is still found in a number of respondents. These findings are consistent with the report of Trihadi et al. (2023), which explains that early detection of hypertension is strongly influenced by regular access to primary health services. Irregularities in checking blood pressure cause hypertension often not to be diagnosed in the early stages, so the risk of complications increases. In communities such as Koya Village, geographical and socio-economic factors have the potential to increase barriers to accessing health services on a regular basis, thus reinforcing the finding that low frequency of health control can contribute to the high prevalence of hypertension.

The discussion of the results of this study becomes even more relevant when paying attention to the broad context of the social determinants of health as explained by Marmot (2015). Factors such as education level, employment conditions, access to information, social structure, and culture interact to shape public health behavior patterns. In this study, the majority of respondents were high school educated and unemployed, a condition that can affect the level of knowledge about hypertension, risk control ability, and access to health information. In addition, the social norms of the North Sulawesi community regarding alcohol and cigarette consumption are very strong, so individuals living in these neighborhoods are more vulnerable to adopting risky behaviors. The findings in Table 2 reinforce the concept of this social determinant, as respondents with hypertension showed a higher tendency to smoke, consume alcohol, and have low physical activity than non-hypertensive respondents.

These findings suggest that hypertension in the Koya Village community cannot be explained by biological or clinical factors alone, but is a manifestation of a complex interaction between behavioral factors and the socio-cultural environment. Behavioral and environmental approaches have long been recognized as an important foundation in the control of hypertension and other non-communicable diseases, as described by WHO (2021) and Rahmawati & Setyawan (2022). Thus, emphasis on controlling smoking, alcohol, and increasing physical activity behavior is indispensable as a fundamental strategy in efforts to prevent hypertension at the community level. The results of this study enrich local empirical evidence and strengthen the argument that community-based public health approaches, including health

education, early detection, and behavior modification, are more effective when tailored to the social and cultural characteristics of local communities.

CONCLUSION

The results of the study show that hypertension is a prominent health problem in Koya Village with a prevalence of 46.7%, a higher figure than the national prevalence. The high number is closely related to the dominant behavioral risk factors, particularly smoking habits and alcohol consumption, which are found in more than half and one-third of respondents, respectively. This risk pattern was reinforced by the findings that respondents with a history of smoking and alcohol consumption had a higher proportion of hypertension, as illustrated in the visual distribution of the study. Physical activity that tends to be low and the frequency of irregular health controls also increase the potential for hypertension in this population.

These findings confirm the importance of a community-based promotive–preventive approach, focusing on controlling smoking behavior, reducing alcohol consumption, increasing physical activity, and strengthening early detection through primary health facilities. The main contribution of this research lies in the provision of micro-community-based empirical evidence that enriches the understanding of the social determinants and behaviors of hypertension in the local context of Eastern Indonesia, an area that is still limited in the literature. This research also provides a scientific basis for the planning of public health programs that are more adaptive to the local socio-cultural context.

Follow-up research is recommended to apply analytical designs with larger sample sizes to test the causal relationship between behavioral factors and hypertension. Quantitative measurements related to physical activity, salt consumption, stress, and other environmental factors also need to be considered in order to provide a more comprehensive and in-depth picture of risk.

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