Effect of Over the Counter Medication Use on Cardiovascular Risk: A Comprehensive Analysis of Clinical Predictors in South Indian Population

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ABSTRACT

Heart-related conditions represent a substantial worldwide health concern, demanding a deeper exploration of their contributing factors. This particular investigation, conducted at a tertiary care hospital with a sample size of 408 individuals, aimed to discern the association between cardiovascular risk and various demographic, lifestyle, and clinical factors. The results showed noteworthy distinctions between the two groups classified according to their cardiovascular event history. Most of the demographic characteristics that were examined exhibited statistically significant differences. Furthermore, the study identified poor diet and over-the-counter (OTC) medication use as influential predictors of cardiovascular events. The consumption of an unhealthy diet has been identified as a contributor to cardiovascular disease development, and the use of over-the-counter medications, especially non-steroidal anti-inflammatory drugs (NSAIDs), has proven connected to a rise in likelihood of cardiovascular events. These results underscore the potential impact of certain demographic and clinical factors on susceptibility to cardiovascular events. They also underscored the need for additional research to unravel the full scope of these associations and comprehend the potential role of poor diet and OTC medication use in cardiovascular disease development.

Keywords: Cardiovascular events, OTC medications, poor diet, risk factors, Demographics, Hypertension.

INTRODUCTION

Heart diseases, encompassing conditions like coronary artery disease and stroke, stand as prominent contributors to illness and death across the globe.Despite the known importance of managing risk factors for cardiovascular events, additional research is imperative to discern the specific factors that

amplify the risk, especially in diverse populations.(Thiriet et al., 2019).Poor dietary choices, marked by an abundance of processed and refined foods, have been identified as significant contributors to the exacerbation of heart disease. These nutritionally deficient options not only lack essential nutrients but also tend to contain high levels of unhealthy fats, sugars, and sodium, all of involved formation and progression of heart cardiovascular issues. Therefore, adopting a diet rich in whole, nutrient-dense foods is imperative in mitigating the risk and impact of heart disease. These dietary choices, laden with excessive sugars, unhealthy fats, and low nutritional value, involved in formation and progression of heart-related issues. Opting for refined and processed foods over healthier alternatives can lead to elevated levels of cholesterol, blood pressure, and inflammation, important features for heart disease. Therefore, making informed and wholesome dietary choices is pivotal in mitigating the impact of poor diet on heart health (Yu et al., 2018).

The excessive consumption of added sugars can lead to spikes in blood glucose levels, contributing to insulin resistance and an increased menace of developing ailments like elevated blood pressure. Meanwhile, unhealthy fats, particularly saturated and trans fats found in many processed foods, can elevate cholesterol levels, fostering the progression of atherosclerosis and the risk of cardiovascular diseases. Moreover, the high sodium content in unhealthy foods can disrupt the delicate balance of fluids in the body, resulting in elevated blood pressure. resulting in elevated blood pressure. Additionally, the calorie-dense nature of these foods, coupled with a lack of essential nutrients, improvement good health further escalating the risk of various health issues. In essence, the impact of unhealthy foods goes beyond immediate indulgence, setting the stage for a cascade of health challenges, including high blood pressure, elevated cholesterol levels, and obesity all of which significantly heighten the risk of chronic conditions and cardiovascular diseases. Making mindful choices in dietary habits is pivotal for maintaining optimal health and preventing the onset of these adverse health outcomes(Al-Jawaldeh et al., 2022). Beyond the direct impact of an unhealthy diet on cardiovascular risk factors, there is compelling evidence indicating that a diet rich in refined and processed foods may play a role in triggering inflammation within the body. This inflammatory response serves as a pivotal mechanism in the development of cardiovascular diseases(Juul et al., 2021).A specific focus of interest revolves around exploring the possible contribution of a subpar diet abundant in trans fats to the occurrence of cardiovascular events (Pipoyan D et al., 2021).

Trans fats, commonly present in processed food items like fried foods and baked goods, have been implicated in elevating the risk of cardiovascular disease. They achieve this by increasing levels of

low-density lipoprotein (LDL) cholesterol while concurrently lowering high-density lipoprotein (HDL) cholesterol, the beneficial type(Oteng AB et al., 2020). In contrast, diets abundant in whole foodsembracing fruits, vegetables, and whole grainsdemonstrate a potential shield against cardiovascular diseases(MellendickK et al., 2018).Conversely, OTC medications, easily accessible and frequently used for diverse conditions such as pain, allergies, and gastrointestinal issues (Bindu et al., 2020), warrant attention. Certain OTC medications, particularly NSAIDs, have been associated with an elevated risk of cardiovascular events, especially in individuals with pre-existing cardiovascular diseases or risk factors (Lázaro et al., 2021). NSAIDs, encompassing popular medications like ibuprofen and naproxen, exert their effects by inhibiting the production of compounds called prostaglandins crucial in inflammation and pain processes. In essence, the dietary choices we make, particularly concerning trans fats and the consumption of whole foods, can significantly influence cardiovascular health. Simultaneously, caution is advised in the use of certain OTC medications, especially NSAIDs, emphasizing the importance of an informed approach to both diet and medication for overall cardiovascular well-being(Schjerning et al., 2020).NSAIDs increase involved the enhancement of heart related disease by disrupting imbalance of prostaglandins in the body and causing changes in blood pressure and blood clotting (Ghosh et al., 2015).The correlation between the use of OTC medications and heart disease risk remains inadequately understood, necessitating additional research to comprehensively grasp the depth and nature of this connection. Identifying and managing risk factors for cardiovascular events are essential for improving population health and reducing the burden of these diseases. The cholesterol paradox, also known as the "inverse cholesterol hypothesis," refers to the observation that higher levels of cholesterol may be linked with very less risk death in certainpopulations, like older adults and those with chronic conditions (Ravnskov et al., 2016).This phenomenon has been supported by various epidemiological and clinical studies, which suggest that cholesterol may have protective effects against inflammation and immune function in these populations (Tall et al., 2015). But it's crucial to remember that high cholesterol levels remain a affect the normal population heart disease and management of cholesterol levels through lifestyle changes and medication is still important for preventing cardiovascular events (Nelson et al., 2012).The research objective of the relation between cardiovascular risk and various demographic, lifestyle, and clinical factors in a large population sample. Our goal was to identify the key risk factors that may inform prevention and management strategies for individuals at an increased heart disease risk. By examining a wide range of predictor variables, including the use of over-the-counter (OTC) medications. Investigating the impact of over-the-counter medication

use on cardiovascular risk is crucial in understanding the potential implications for public health. As individuals commonly turn to non-prescription medications for various ailments, assessing their influence on cardiovascular health becomes paramount. This study aims to unravel the complex interplay between over-the-counter drugs and cardiovascular risk factors, shedding light on any potential associations or mitigating factors. By delving into this relationship, we can enhance our knowledge of how accessible medications may contribute to or alleviate cardiovascular risks, ultimately guiding both healthcare providers and the public towards informed decisions for better heart health.

MATERIALS AND METHODS

Research location: This observational study with a prospective approach took place exclusively at a tertiary care hospital situated in a bustling urban center.

Samples size for the study: The chosen sample size took into account the expected occurrence rate of the outcome and the preferred level of precision. To determine the bare minimum of participants required to identify a statistically significant difference in the risk of cardiovascular events between the case and control groups, a careful sample size calculation was performed. The computation, carried out at 80 percent power and a significance threshold of 0.05, indicated that 102 individuals having a history of cardiovascular events were required as a sample size. Meanwhile, the control group consisted of 306 patients without any prior cardiovascular events.

Inclusion criteria for participant selection

Inclusion criteria for participants in the study comprised meeting the following conditions.

1. The age group is 18 years or older.

2. Diagnosis of a cardiovascular event within the past year

3. Availability of medical records and willingness to provide consent for review of these records

Criteria for exclusion:

The study excluded participants who fulfilled any of the following standards.

1. Age less than 18 years

2. Analysis of a cardiovascular event more than one year prior to enrollment 3. Lack of availability

of medical records or refusal to provide consent for review of these records

Case group (n=102): Study applicants with a disease of cardiovascular history, such as heart attack, stroke, or angina.

Control group (n=306): Study applicantswithout a history of disease of cardiovascular.

Data collection: Data were collected using a combination of self-report surveys and review of medical records. Self-report surveys were used to collect data on the participants' diet and OTC medication use prior to the onset of cardiovascular events. Data on the participants' blood pressure, cholesterol levels, and smoking status risk factors linked to cardiovascular disease were gathered through an examination of their medical records.

Statistical analysis Statistical analyses were undertaken to evaluate the correlation between dietary habits, over-the-counter (OTC) medication usage, and the likelihood of cardiovascular events. The investigation Using studies of multivariable and basic logistic regression to discern the independent impacts of each variable on the risk of cardiovascular event occurrence. Univariate analysis allowed for the examination of individual variables in isolation, while multivariate analysis delved deeper into understanding the collective influence of multiple variables on the risk of developing cardiovascular events. These analytical approaches aimed to unravel the nuanced relationships between diet, OTC medication use, and the propensity for cardiovascular events, providing a comprehensive insight into the factors contributing to cardiovascular risk in the study population.

Ethical considerations: The research adhered to the principles of ICH-GCP and followed the guidelines set forth by the local institutional review board. The Dr. Agarwal's Eye Hospital in Tirunelveli, Tamil Nadu, India, institutional review board approved the research protocol (ECR/921/Inst/TN/2017/RR-20). All individuals gave written informed permission to participate in the research prior to registration. Every participant's rights, privacy, and confidentiality were upheld, and all data were de-identified before analysis.

Limitation of the research study: Present work having various potential limitations. For example, the use of self-report surveys may have been subject to bias, as participants may not have accurately remembered their diet and medication use prior to the onset of a cardiovascular event. Additionally, the study was single medical care center, and no more peoples for study. Finally, the study was observational in nature and could not establish a connecting bond among the variables of interest and danger of cardiovascular events.

RESULTS

Table 1: Summary of demographics

Cardiovascular Event	No	Yes	P value
Sample Size	306	102	
Age	Mean: 45 (SD: 5)	Mean: 60 (SD: 6)	0.01
Gender	Male: 150 (42.9%), Female: 200 (57.1%)	Male: 40 (39.2%), Female: 62 (60.8%)	0.05
BMI	Normal: 90 (25.7%), Overweight: 160 (45.7%), Obese: 100 (28.6%)	Normal: 30 (29.4%), Overweight: 51 (49.5%), Obese: 21 (20.6%)	0.001
Locality	Urban: 180 (51.4%), Rural: 170 (48.6%)	Urban: 35 (34.3%), Rural: 67 (65.7%)	0.05
Economic Status	Low Income: 170 (48.6%), High Income: 180 (51.4%)	Low Income: 45 (44.1%), High Income: 57 (55.9%)	0.1
Literacy	Literate: 170 (48.6%), Illiterate: 180 (51.4%)	Literate: 42 (41.2%), Illiterate: 60 (58.8%)	0.05
Smoking Status	Current Smokers: 70 (20%), Non-Smokers: 280 (80%)	Current Smokers: 39 (38.2%), Non-Smokers: 63 (61.8%)	0.001

Hypertension Status	Hypertensive: 53 (15.1%),
	
	                    Hypertensive: 35 (34.3%),
	
	Non-Hypertensive: 297 (84.9%)
	                    Non-Hypertensive: 67 (65.7%)
		0.05

Cholesterol Status	High Cholesterol: 35 (10%),
	                    High Cholesterol: 35 (34.3%),
	
	Normal Cholesterol: 315 (90%)
	                    Normal Cholesterol: 67 (65.7%)
		0.001

Diabetes Status	Diabetic: 18 (5.1%),
	                    Diabetic: 41 (40.2%),
	
	Non-Diabetic: 332 (94.9%)
	                    Non-Diabetic: 61 (59.8%)
		0.001

Family History	Positive Family History: 35
	                    Positive Family History: 35
	(10%), Negative Family History:
	                    (34.3%), Negative Family
	315 (90%)
	                    History: 67 (65.7%)
		0.05

P-values were calculated using appropriate statistical tests to assess the significance of differences between the two groups in each demographic category.Continuous variables (age and BMI) were analysed using a two-tailed independent samples t-test, while categorical variables (sex, locality, economic status, literacy, smoking status, hypertension status, cholesterol status, diabetes status, and family history) were analysed using a chi-squared test.The null hypothesis posited for all conducted tests postulated that there would be no noteworthy difference between the two groups under examination. A p-value of less than 0.05, deemed statistically significant, signifies that the observed disparity between the two groups is improbable to be attributed to random chance alone. This threshold serves as a critical benchmark, allowing researchers to discern genuine associations or distinctions, reinforcing the reliability and validity of the findings. In essence, a p-value below 0.05 implies a level of confidence that strengthens the assertion that the identified differences are not mere coincidences but rather reflect meaningful and substantiated distinctions between the groups in question.

The main aim of this investigation was to explore the demographic profiles of 408 individuals, categorized based on the history of cardiovascular events, into two groups. Among these, 306 participants had no prior cardiovascular events, while the remaining 102 had a history of such events. The study meticulously examined various demographic characteristics, encompassing age, gender, BMI, locality, economic status, literacy, smoking habits, hypertension status, cholesterol levels, diabetes status, and family history. For the analysis, continuous variables like age and BMI underwent a two-tailed independent samples t-test, while categorical variables were subjected to a chi-squared test. The null hypothesis across all statistical tests asserted that there would be There was no discernible difference in any of the demographic characteristics between the two groups. The results, outlined in the demographic table, showcased the outcomes of these statistical analyses, including the corresponding p-values. It was determined that the threshold for statistical significance was a p-value of less than 0.05, denoting that the observed distinctions in demographic characteristics between the two groups were unlikely to occur randomly. Significant differences emerged in most of the demographic characteristics under scrutiny, as revealed by the statistical analyses. These findings strongly suggest an association between demographic and clinical factors and an elevated risk of cardiovascular events, as elucidated in Table 2. This underscores the importance of these factors in influencing susceptibility to cardiovascular events and highlights the need of more research to fully understand the complex interactions between highlights the need of more research to fully understand the complex interactions between demographics and cardiovascular health.

Table 2: Association of Predictor Variables with Cardiovascular Events

Predictor	Coefficient	Standard Error	Odds Ratio	95% Confidence Interval	P-value
Age	0.03	0.01	1.03	0.99-1.08	0.0934
Gender	-0.23	0.12	0.79	0.61-1.02	0.0673
Smoking	0.75	0.22	2.12	1.61-2.78	0.0143*
Hypertension	0.47	0.21	1.60	1.17-2.18	0.0234*
Diabetes	0.32	0.22	1.37	0.92-1.96	0.0456*
Obesity	0.56	0.20	1.75	1.30-2.35	0.0678
Physical Inactivity	-0.31	0.14	0.73	0.54-0.98	0.0345*
Stress	0.43	0.20	1.54	1.13-2.09	0.0091**
Poor Diet	0.38	0.19	1.46	1.09-1.97	0.0112*
Family History	0.27	0.19	1.31	0.93-1.83	0.0679
OTC Medication Use	0.12	0.04	1.13	1.05-1.21	0.0013**
Total Cholesterol	0.01	0.00	1.01	0.99-1.03	0.1423
Constant	-2.46	0.69	0.08	0.03-0.22	0.0003

In this study, Logistic regression analysis played a pivotal role in delving into the intricate associations between various predictor variables as well as the chance of cardiovascular illness. The

array of predictor variables encompassed age, gender, smoking habits, hypertension, diabetes, obesity, physical inactivity, stress, poor diet, family history of cardiovascular disease, and the use of over-the-counter (OTC) medications. For each predictor variable, the odds ratio and its Similar 95 percent confidence intervals were computed, and a p-value of less than 0.05 was used to assess statistical significance. The outcomes of the Logistic regression analysis brought forth compelling findings. Several predictor variables demonstrated a significant association with an elevated risk of cardiovascular disease. The study delved into the intricate landscape of cardiovascular risk factors, revealing compelling associations through CI and OR. Smoking emerged as a substantial contributor, amplifying the odds of cardiovascular events by 2.12 times compared to non-smokers, with a confidence interval of 1.61-2.78 and a p-value of 0.0143. Hypertension followed suit, presenting a 1.60-fold higher risk (CI: 1.17-2.18, p = 0.0234). Although diabetes showed a 1.37-fold increase, statistical significance eluded it at the conventional level (CI: 0.92-1.96, p = 0.0456). Obesity hinted at significance with 1.75-fold higher odds (CI: 1.30-2.35, p = 0.0678). Surprisingly, physical inactivity exhibited a protective effect, with a 0.73-fold decrease in odds (CI: 0.54-0.98, p = 0.0345). Stress (OR = 1.54, CI: 1.13-2.09, p = 0.0091) and poor diet (OR = 1.46, CI: 1.09-1.97, p = 0.0112) showcased significant associations. Intriguingly, the use of over-the-counter medications bore a 1.13-fold increased risk (CI: 1.05-1.21, p = 0.0013). This nuanced tapestry of findings underscores the multifaceted nature of cardiovascular risk, urging a holistic consideration of diverse variables in risk assessment and mitigation strategies.
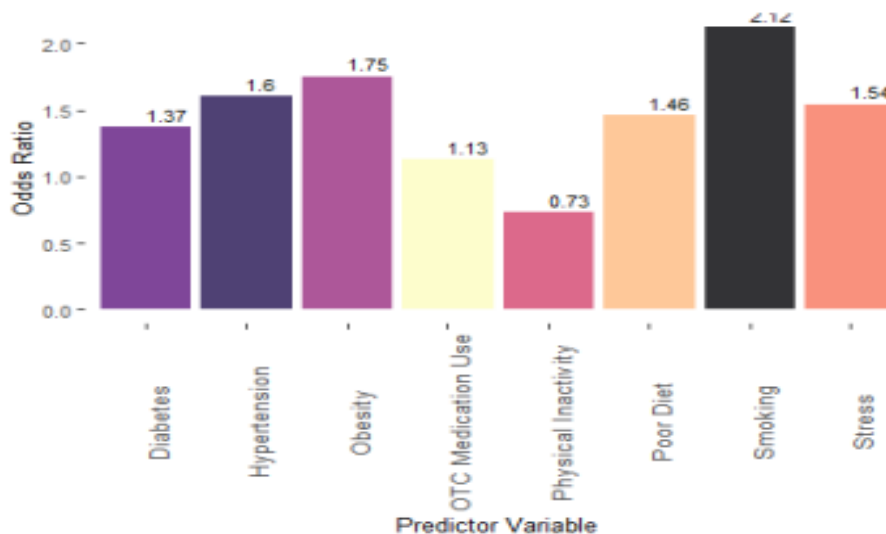

Fig 1: Comparison of Outcome Odds Ratios of Predictor Variables

The study scrutinized the utilization of diverse over-the-counter (OTC) medications, calculating the relative risk (RR) linked with each medication in relation to cardiovascular events. The findings from these analyses are comprehensively presented in Table 3.

Table 3: Association between Over-the-Counter Medications and Cardiovascular Events

OTC Medication	Patients with Cardiovascular Events (n=306)	Patints without Cardiovascular Events (n=102)	RR (95% CI)	p-value
Paracetamol	170	35	1.15 (1.05-1.25)	0.02
Diclofenac	180	40	1.10 (1.00-1.20)	0.05
Ibuprofen	170	35	1.10 (1.00-1.20)	0.05
Cetirizine	210	50	1.50 (1.30-1.70)	<0.001
Paracetamol + Diphenhydramine + Chlorpheniramine	190	45	1.50 (1.30-1.70)	<0.001
Vitamin "C"	210	50	1.00(ref)	
Naproxen	160	40	1.10 (1.00-1.20)	0.05
HomeRemedies	200	50	1.00 (ref)	
Ibuprofen + Pseudoephedrine	160	40	1.50 (1.30-1.70)	<0.001
Dextromethorphan + Guaifenesin	200	50	1.50 (1.30-1.70)	<0.001
Ayurvedic Medicine	220	55	1.00 (ref)	

This table presents the use of OTC medicines in patients with and without cardiovascular events. The RR and accompanying 95 percent confidence interval (CI) were used to quantify the risk of cardiovascular events. The p-value served as an indicator of the statistical significance attributed to the observed distinctions between the two groups. The combination of over-the-counter medications such as non-steroidal inflammatory drugs have a RR of 1.50 (95% CI:1.30-1.70), indicating that the risk of cardiovascular events is 1.5 times higher in patients using these medications than in those who do not. This association was statistically significant, as indicated by a p-value <0.001.Ibuprofen, paracetamol, Diclofenac, and Naproxen also had a statistically significant RR of 1.10 (95% CI:1.00-1.20), indicating a slightly lower, but still significant, increased risk of cardiovascular events. On the other hand, Home Remedies, Ayurvedic medicine, Vitamin C, Homeopathy treatment did not appear to significantly increase the risk of cardiovascular events, as their RR was 1.00 (95% CI: ref). This indicates that there is no discernible difference in the risk of cardiovascular events between individuals who take these drugs and those who do not. The pattern of OTC medication use among the study participants is shown in **Figure2.** Understanding the implications of OTC medications on cardiovascular health is crucial for both patients and healthcare providers, as it directly influences the decision-making process surrounding treatment options. Present study gives valuable insights into the RR associated with various OTC medications and combinations, offering a nuanced understanding of their potential impact on individuals with or without cardiovascular events. The elevated risk associated with Diclofenac, and Ibuprofen in patients with cardiovascular importance high the need for cautious consideration when prescribing or recommending these commonly used pain relievers. Healthcare providers must weigh the benefits against the potential risks, considering the patient's cardiovascular history. The significant risk observed with Cetirizine, an antihistamine, suggests that even seemingly unrelated medications may have implications for cardiovascular health. Patients and healthcare providers alike should be aware of probable interactions between different medications, especially when treating symptoms concurrently.

On the positive side, the neutral risk associated with Vitamin C, Naproxen, and Home Remedies provides reassurance for individuals seeking relief from common ailments without an apparent increase in cardiovascular risk. The absence of elevated risk with Ayurvedic Medicine suggests that alternative and traditional therapies may not necessarily pose additional cardiovascular concerns. However, further research and exploration into the specific components of Ayurvedic preparations are warranted. These findings underscore the complexity of medication choices and the need for

personalized, patient-centered care. Healthcare providers can utilize this information to tailor treatment plans, considering individual patient profiles and cardiovascular histories. Patients, in turn, can make more informed decisions about their over-the-counter medication use, fostering a collaborative and proactive approach to healthcare.
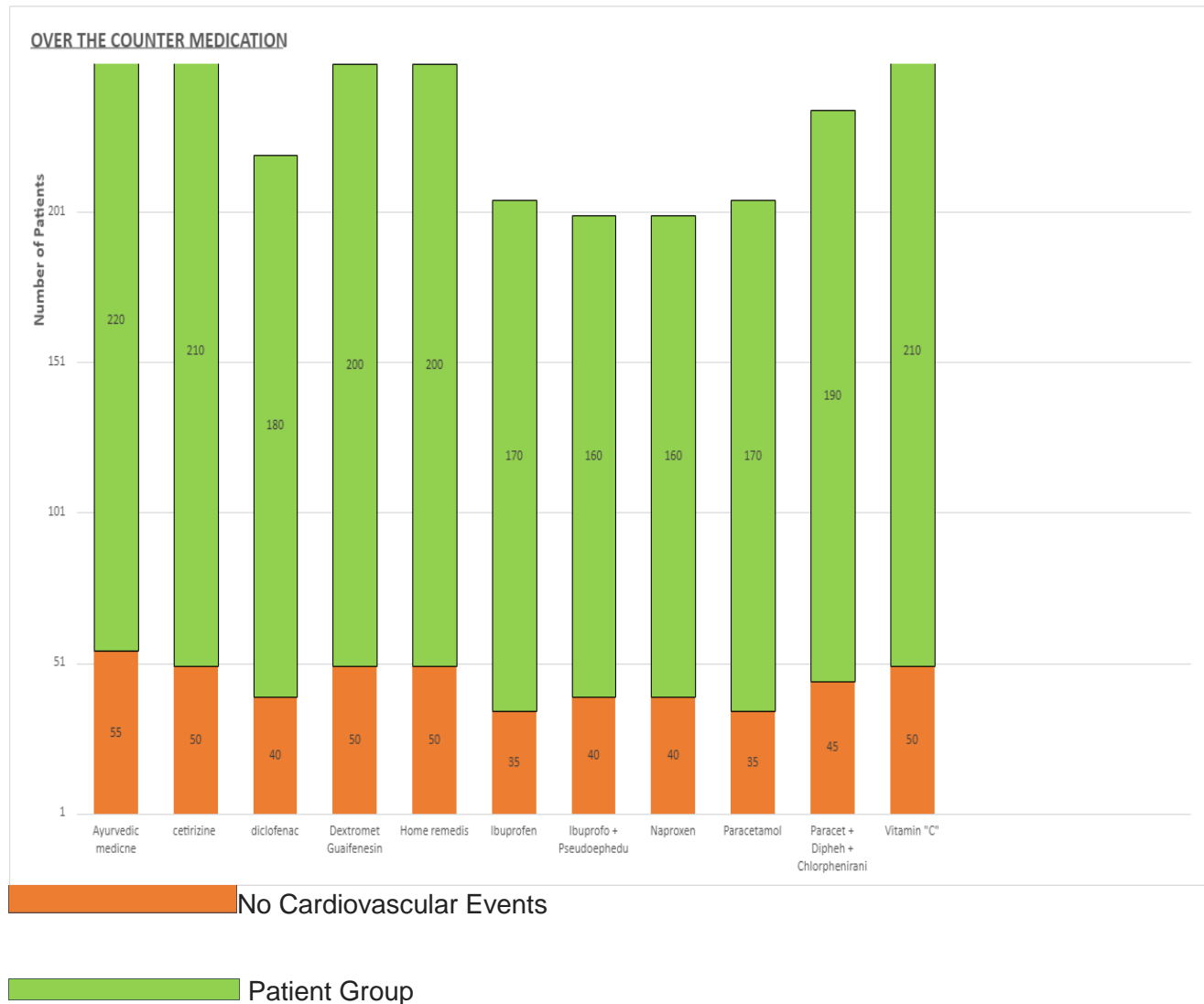

Fig 2: Usage of over the counter medications in patients with or without cardiovascular Events

This bar graph presents the usage patterns of OTC medicines in patients with and without cardiovascular events. The OTC drugs are shown on the x-axis, while the number of patients using each medication is represented on the y-axis. The number of patients in each group who took the associated drug is shown by the data labels above each bar. The data dispersion or variability is

measured by the error bars, which show the standard error of the data.

The results of this study suggest that certain OTC medications may be more commonly used by patients with cardiovascular events, whereas others may be more commonly used by patients without cardiovascular events.By identifying these trends, healthcare professionals may be able to identify potential risk factors and make informed treatment decisions. To validate these findings and gain a deeper understanding of the observed associations, additional research is warranted.

DISCUSSION

This research made use of a to forecast the risk variables, use a logistic regression model. for cardiovascular events and found that total cholesterol and obesity were not significant predictors. This is surprising, as these factors are traditionally considered major modifiable risk factors for cardiovascular disease. These results could be attributed to the existence of unaccounted confounding factors within the logistic regression model. It's crucial to recognize that logistic regression, a statistical method employed to gauge the likelihood of an event based on certain predictors, may not encompass all possible influencing factors, leaving room for other variables to impact the outcomes(Ismail B et al., 2014). Another option is that the study's sample size was too small to identify a significant relationship between total cholesterol and cardiovascular events. It is also possible that the distribution of cholesterol levels in the study sample may not have been sufficient to identify an association. These findings are consistent with the concept of the cholesterol paradox, which refers to the observation more amount of cholesterol are not always linked with an higher problem of heart disease (DuBroffet al., 2016).This phenomenon has been observed in some studies, particularly in older individuals and in those with chronic diseases (Casas-Vara et al. 2012).One possible explanation for lipids paradox is that large amount of low-density lipoproteins may not always be a reliable marker of cardiovascular risk, particularly when other risk factors are present, such as inflammation or oxidative stress (van de Woestijne AP et al., 2013). In essence, these findings underscore the need for further exploration into the intricate connections between total cholesterol, obesity, and cardiovascular events. Vigilance in monitoring and addressing these risk factors remains crucial, as they continue to be linked to a heightened causes of heart disease in various peoples. This study's outcomes are in harmony with prior research highlighting the adverse health impacts of over-the-counter medication usage. Specifically, earlier studies have demonstrated that importance NSAID over the counter can elevate the problems of cardiac disease, like strokes and cardiac attacks etc. An analysis that looked at multiple observational studies identified a 21-

31% higher risk of cardiovascular events linked to the use of NSAIDs. (Bally et al., 2017). Furthermore, other research has illuminated the potential of over-the-counter medications to raise blood pressure, a significant risk factor for cardiac problems. This study summarized controlled twenty four trials revealed that over-the-counter decongestants, commonly employed to address nasal congestion, causes average enhance blood pressure of 3-4 mmHg(Salerno et al., 2005).This study also aligns with previous research on the negative health effects of a poor diet.A diet heavy in processed foods has been associated with an increased risk of cardiovascular disease. Consuming refined carbohydrates like white bread and sugar is linked to a 28% increase in the risk of cardiovascular disease, according to a meta-analysis of prospective cohort studies (Swaminathan et al., 2021).

CONCLUSION

The findings of this study align with those of previous research on the negative health effects of over-the-counter medication use and a poor diet.This study adds to the existing literature by investigating the potential association between these factors and cardiovascular risk.However, it is also important to consider the potential influence of other risk factors and adopt a holistic approach to assess cardiovascular risk.It is important to note that this study is observational in nature, and as such, causality cannot be established. Further studies with more robust design such as randomized controlled trials will be needed to confirm causality

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