

Modifiable risk factors of Non-Communicable Diseases

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Summary

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Modern epidemiological approaches in nutrition have revolutionized our understanding of the link between diet and health. By investigating the dietary habits of populations and analyzing data on disease patterns, epidemiologists have been able to identify key risk factors for chronic conditions. This has led to the development of evidence-based dietary guidelines and interventions aimed at improving public health. In this thesis, we will explore the role of various epidemiological analysis in identifying nutritional risk factors of various diseases. We will also discuss the challenges and future directions of epidemiological research in nutrition.

Chapter 1 starts with a general introduction addressing the various analytic approaches that are utilized in this thesis. For each approach, the concept as well as advantages and disadvantages are reviewed.

Chapter 2 presents an overview of reviews of lifestyle, dietary, and occupational factors that may influence the risk of bladder cancer. It synthesizes the findings from multiple meta-analyses to identify statistically significant associations between various risk factors and bladder cancer. The key aspect of this research is its focus on modifiable risk factors, which are necessary in developing preventive strategies for bladder cancer. The study evaluates the relationship between various forms of tobacco use and bladder cancer, illustrating a strong correlation and a dose-response relationship. It provides insights into how different tobacco products, such as cigarettes, pipes, and cigars, and the duration of their use, impact the risk of developing bladder cancer. Furthermore, the article looks at the impact of dietary factors on bladder cancer risk. It explores the potential protective effects of certain food items, such as fruits and vegetables, and the risks associated with others, like processed meats. The study also examines the role of vitamins and the implications of obesity in relation to bladder cancer. Occupational exposures, especially in professions involving carcinogenic chemicals, are identified as significant risk factors. The study highlights specific occupations, such as those in the tobacco industry, dye industry, and chimney sweeping, that are associated with a higher risk of bladder cancer. In addition to these primary factors, the article also considers the influence of other lifestyle elements, including physical activity and body mass index (BMI),

on bladder cancer risk. The analysis provides a comprehensive view of how various lifestyle choices and occupational exposures can contribute to the risk of developing bladder cancer. The article underscores the potential for bladder cancer risk reduction through lifestyle and occupational modifications. It emphasizes the importance of public health interventions and individual lifestyle changes in preventing bladder cancer. The study's findings are helpful in guiding future research and public health policies aimed at reducing the incidence of bladder cancer through modifiable risk factors.

Chapter 3 based on the article titled "Modifiable risk factors for the prevention of prostate cancer: a systematic meta-review," presents a detailed examination of factors that can potentially influence the risk of developing prostate cancer. This comprehensive review draws on previous meta-analyses and pooled analyses, to explore the relationship between prostate cancer and various modifiable factors. Dietary factors are a significant focus of the study. The research examines how specific foods and supplements might affect prostate cancer risk. It scrutinizes the evidence surrounding the consumption of red and processed meats, dairy products, and certain types of fats. Additionally, the study evaluates the impact of various vitamins and minerals, such as Vitamin E, selenium, and lycopene, often hyped for their potential protective effects against cancer. The analysis considers both the positive and negative effects of these dietary components. The article also investigates lifestyle factors and how factors like smoking, alcohol consumption, physical activity, and body mass index (BMI) correlate with prostate cancer risk. The study examines the evidence, highlighting how these lifestyle choices might influence the development and progression of the disease. Moreover, it explores less commonly discussed aspects, such as sexual behavior, marital status, and educational attainment, providing a holistic view of how various lifestyle elements could contribute to prostate cancer risk. Occupational exposures are another crucial area covered in the study. It identifies specific occupational hazards, such as exposure to pesticides, that may elevate the risk of prostate cancer. The analysis includes a detailed review of studies examining workers in various industries. The study employed a comprehensive literature search, strict criteria for the inclusion and exclusion of studies, and an assessment of the risk of bias to ensure that the review's conclusions are based on high-quality evidence.

Summary

In **Chapter 4**, the article "Association between soft drinks consumption and asthma: a systematic review and meta-analysis" utilized systematic review and meta-analysis approach to summarize available original studies on the potential relationship between soft drink consumption and the prevalence of asthma in adults and children. This study integrates findings from various observational studies, underscoring the importance of dietary factors in the context of asthma epidemiology. The study objective is to examine the association between soft drink consumption and asthma prevalence. This is achieved through combining results of original observational research data, gathered from multiple electronic databases using comprehensive search strategy. The inclusion criteria focused on studies that examined the relationship between soft drink consumption (including maternal consumption during pregnancy) and asthma or wheeze. The study results found a significant association between soft drink consumption and increased odds of asthma in both adults and children. Specifically, the odds ratios indicated a higher likelihood of asthma among those with higher soft drink consumption, compared to those with lower consumption levels (both in adults [OR=1.37; 95% CI, 1.23 to 1.52] and children [OR=1.14;95% CI, 1.06 to 1.21]). Interestingly, this association persisted for sugar-sweetened soft drinks but not for carbonated drinks in children. The study also explored prenatal exposure to soft drinks and its association with asthma in children, uncovering a marginally significant relationship. From a methodological perspective, the strengths of the study lie in its comprehensive literature search and the inclusion of a large sample size, encompassing over 468,836 participants with more than 50,000 asthma cases. However, the study identified a major research gap due to the predominance of cross-sectional studies and the lack of prospective studies, which could impact the strength of causal inferences. The heterogeneity in study designs and measures also poses challenges in interpreting the results. The observed association between soft drink consumption and asthma underscores the need for more longitudinal research to establish causality and better understand the underlying mechanisms. For health professionals and policymakers, these findings highlight the importance of dietary habits in asthma management and prevention strategies.

In **Chapter 5**, we used another approach for combining original research studies, namely pooled analysis. The article "Tea Consumption and Risk of Bladder Cancer in the Bladder

Cancer Epidemiology and Nutritional Determinants (BLEND) Study: Pooled Analysis of 12 International Cohort Studies" provides a comprehensive analysis of the relationship between tea consumption and bladder cancer risk. This study combines data from 12 different cohort studies, involving over 532,000 participants, to investigate this association more robustly than individual studies could. The study methodology through the use of Cox regression models, stratified by the study center, allowed for the estimation of hazard ratios and 95% confidence intervals for different levels of tea consumption. Additionally, the research employs fractional polynomial regression models to explore the dose-response relationship between tea consumption and bladder cancer risk. One of the key findings of this study is the identification of a statistically significant inverse association between higher levels of tea consumption and the risk of bladder cancer. This inverse relationship was particularly pronounced among men and individuals with a history of smoking (both current and former smokers). The study reported that each additional 100 ml of tea consumed per day was associated with a reduced risk of bladder cancer (HR-increment = 0.97; 95% CI = 0.96-0.98). These results indicate a potential sex-dependent effect and an interaction with smoking status in the relationship between tea consumption and bladder cancer risk. The potential protective effect of tea consumption against bladder cancer emphasizes the need for further research to understand the underlying mechanisms. Also, the interaction of this protective effect with factors such as sex and smoking status also warrants further investigation.

Based on the same dataset used in the previous chapter, the paper in **Chapter 6** uses another analytic approach that gained popularity in recent years, namely machine learning techniques. The manuscript titled "Nutrients as predictors of bladder cancer: a machine learning approach in pooled cohorts from 12 countries" presents a comprehensive analysis using machine learning techniques to identify nutritional predictors of bladder cancer. It aims to examine the complex relationships between various nutrients and the risk of bladder cancer, with better performance than traditional epidemiological methods. Machine learning models, including decision trees, logistic regression, random forests, neural networks, and Naive Bayes, were employed. These models were evaluated based on accuracy, precision, recall, F1 score, and the area under the receiver operating characteristic curve (AUC). The models' predictive performance and feature importance were analyzed, particularly focusing

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on nutrients as predictors. Results show that the logistic regression, neural network, and decision tree models performed best in predicting bladder cancer cases. The logistic regression model exhibited the highest discrimination capability. Across the models, the most consistent nutrient predictors of bladder cancer risk were intakes of vitamin D, cholesterol, and vitamin A. Besides nutritional factors, smoking, age, and sex were also strong predictors. The study discusses the implications of these findings, highlighting the role of machine learning in uncovering complex diet-disease relationships. It emphasizes the potential of these techniques in precision preventive medicine and the importance of integrating expert knowledge for meaningful discoveries. The study acknowledges its strengths, including the large sample size and diverse cohorts, and its limitations, such as potential residual confounding and limited generalizability due to the predominance of Caucasian participants.