Associations of Dietary Intakes with Cervical Cancer in Childbearing Age Women : A Scoping Review

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ABSTRACT

Background : Cervical cancer is a global public health problem, particularly in low- and middle-income countries (LMICs). It is the second most frequent and the second leading cause of death in women of reproductive age in the world. In 2022, an incidence of 662,000 and 349,000 deaths was estimated.
Methods : We use a scoping review method using academic journals published from 2020 to 2024. The literature was searched using electronic databases PubMed. We make use of the following search terms: diet or dietary patterns, women, and cervical cancer. A total of 158 research was identified and 9 research was included in this review.
Results : This study highlights the important role of diet in reducing the risk of HPV infection and cervical cancer. The results of this study confirm that combined intake of nutrients with antioxidant properties can reduce the risk of HPV infection and cervical cancer, as well as the importance of a healthy diet as an effective preventive measure.
Conclusion : The study reveals an association between diet and HPV infection and cervical cancer. Dietary patterns play an important role in reducing the risk of HPV infection and cervical cancer.
Keywords: Dietary Intakes, Cervical Cancer, Women, HVP.

INTRODUCTION

Cervical cancer is a global public health problem, particularly in low- and middle-income countries (LMICs). It is the second most frequent and the second leading cause of death in women of reproductive age in the world. In 2022, an incidence of 662,000 and 349,000 deaths was estimated [1]. Human papillomavirus (HPV), classified under the papillomaviridae family, is a diminutive double-stranded DNA virus proficient in adapting to its host's environment, thereby evading immune detection. HPV ranks as the second most common viral agent implicated incancer etiology [2]. Depending on their potential for causing cancer or precursor lesions, HPV is further divided as low or high risk. High-risk HPV(HR-HPV) infection is especially associated with gynecological cancers [2] . Human papillomavirus (HPV) is one of the causative agents of cervical cancer and precursor lesions. Several causes have been shown to affect the risk of persistent HPV infection and the progression of neoplasms, including diet [1]. The mechanism by which diet affects HPV infection and cervical cancer risk relates to immune system support, oxidative stress reduction and cellular health. Essential nutrients such as vitamins A, C, E and zinc strengthen the immune system, helping the body fight HPV infection, while antioxidants from vegetables and fruits neutralize free radicals produced by the virus, reducing oxidative stress that can damage cervical cell DNA [10].

Several studies have identified a relationship between dietary habits, particularly the consumption of fruits and vegetables, and the risk of cervical cancer and HPV infection. Notably, increased dietary intake of certain antioxidants, including vitamins A, B2, E, and folate, has been associated with a reduced risk of HPV infection. Folate, also known as vitamin B9, is an essential nutrient not synthesized endogenously in humans. Dietary sources such as meat, fish, dairy products, and cereals are therefore vital for its acquisition. Emerging evidence suggests that bodily folate levels inversely correlate with the carcinogenesis process in HPV-associated cancers, possibly due to folate's role in maintaining a highly methylated state of the HPV genome [2].

MATERIAL AND METHOD

Figure 1 shows a flow chart following the recommended reporting items for the systematic review and meta-analysis extension for the scoping review (PRISMA-ScR) to illustrate the publication flow from search to final selection. research design study was used to identify dietary pattens and risk of HVP infection in cervical cancer and their relationship. The publication flow from search to final selection is shown in a flow chart that follows the predefined reporting items for the systematic review and extended meta-analysis for scoping review (PRISMA-ScR) as shown in Figure 1.

Determining the focus of the research:

1) What is the prevalence of cervical cancer in women of childbearing age; 2) What types of food are risk factors for cervical cancer; 3) What is the relation between diet in women of childbearing age and cervical cancer?

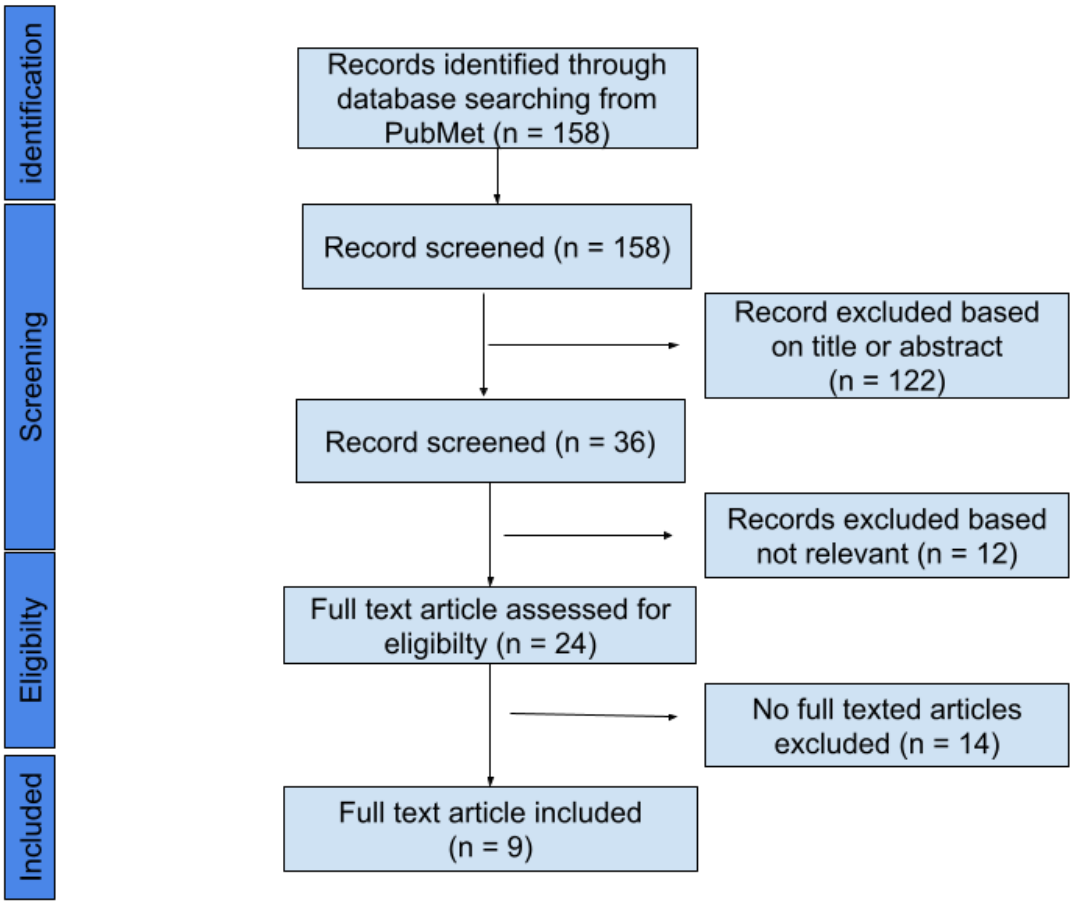
Identifying relevant studies:

An electronic database with PubMed was used to conduct the electronic search. All full-text accessible academic journals published between 2020 and 2024 in English related to the subject were searched thoroughly. The search covered all types of research designs, including retrospective and prospective cohort studies among women of reproductive age, as well as observational studies such as cohort, randomized, longitudinal, cross-sectional, and case-control studies.

Study selection:

After a careful review process, papers were selected if the data regarding: 1) the study population consisted of individuals of childbearing age; 2) the prevalence of cervical cancer in childbearing age; 3) the relationship between diet and cervical cancer; 4) were located globally. We used the main search terms diet OR eating patterns AND women AND cervical cancer as described below.

Figure 1 : flowchart of Scoping Review



Charting the data:

After initially screening the database to identify entries relevant to the main topic, a more detailed screening process was then conducted. This involved applying observational inclusion criteria to select studies or data pertinent to the research objectives. At the same time, exclusion criteria were used to screen out any studies or data that did not meet the required standards or were deemed irrelevant. This two-step screening ensured that only the most relevant and high-quality information was retained for further analysis.

Participant criteria:

Included studies are: 1) subjects were of childbearing age; 2) participation; 3) published in English or Indonesian; 4) accessible only in free full text; and 5) journal issues 2020-2024. All remaining data were included in this coping review, after exclusion of full-text articles that did not meet the criteria.

Collating, summarizing and reporting the result:

Studies are summarized by presenting the country trial, study design, participant characteristics, and findings. Then extracted into the assessment, prevalence of cervical cancer, and association between diet and cervical cancer.

RESULTS AND DISCUSSION

During the search process, 158 possible titles were found to be included. As can be seen, 9 titles were selected for final screening as shown in Figure 1. This study summarizes the findings of the assessment of diet and risk of HPV infection in cervical cancer, and the results of the study, as shown in Table 1. Based on these 9 articles, we obtained brief information. A conservative diet, as well as being from a rural area, was shown to be a protective factor in HPV risk[1]. This is supported by a study from Georgia which showed that the protective effect of consuming fruits and vegetables was highlighted against the development of HPV and cervical cancer in women[3]. In another study there was a negative association between dietary folate intake and risk of HPV infection[2]. And a Chinese study identified an inverse linear relationship between dietary vitamin E intake and overall high and low risk HPV infection[4]. Certain dietary factors including caffeine and calcium may be associated with cervical cancer[5]. There are also studies that show a nonlinear relationship between vitamin K intake and HPV infection[6]. In the Italian study, a proinflammatory diet may be associated with an increased risk of CIN2 and more severe lesions[7]. In another study, GI and GL diets may be associated with an increased risk of CIN1[8]. Whereas the Iranian research study showed that diet and rich nutrition can be helpful for the prevention of cervical cancer and can reduce the risk of disease[9]. And the latter suggests that a diet based on a combination of nutrient intake with antioxidant properties may reduce the risk of HPV infection[7].

Table 1: An overview of research on dietary pattens and risk of HVP infection in cervical cancer.

Author and Country	Study Design	Participants Characteristics	Assessment Dietary Patterns	Assessment risk of HPV infection	Results
Colombia : Luz Adriana Meneses-Urrea, et al; 2024[1]	A multi-group ecological study	3472 women with an age range of 35 to 64 years.	the conservative dietary pattern, consisting of fruits and vegetables.	protective factors.	A conservative eating pattern, as well as belonging to a rural area, are evidenced as protective factors.
Georgia : BIBILEISHVILI, et al; 2024[3]	A cross-sectional study	893 women with an age range of 25 to 60 years.	consuming fruits and vegetables.	protective effect against the development of HPV and cervical cancer.	The protective effect of consuming fruits and vegetables is highlighted against the

					development of HPV and cervical cancer in women.
China : Shuo Jin, et al; 2023[2]	A cross-sectional study	6747 women aged between 18 and 59 years.	dietary folate intake exceeded 193.847 mcg/day.	the higher the folate intake, the lower the risk of HPV infection.	indicate a negative association between dietary folate intake and the risk of HPV infection.
China : Qian Zhou, et al; 2023[4]	A cross-sectional study	5809 people aged 18–59 years.	Vitamin E	a preventive effect on genital high-risk HPV infection.	identified inverse linear relationships between dietary vitamin E intake and overall high- and low-risk HPV infection.
China : Guixian Zhu, et al; 2022[5]	A cross-sectional study	12,437 Women aged over 20 years from the National Health and Nutrition Examination Survey (NHANES)	30 dietary factors including 4 macronutrients, 15 vitamins, 9 minerals, caffeine and alcohol	Association with cervical cancer.	Specific dietary factors including caffeine and calcium may have associated with cervical cancer.
China : Yinhui Jiang, et al; 2022[6]	Cross-sectional observation	13,447 Female participants aged 18-59 years old with data of HPV testing	Dietary vitamin K intake	Association with HPV-infection	There was a nonlinearity between vitamin K intake and HPV-infection.The HPV-subtype was not associated with vitamin K intake.
Italy :	Cross-	539 women	Composite	Association	Pro-

Andrea Maugeri, et al; 2022[7]	sectional study	with a mean age of 40·2 years recruited from 2012 to 2015 at the Cervical Cancer Screening Unit of the 'Azienda Sanitaria Provinciale' of Catania (Italy).	Dietary Antioxidant Index (CDAI) and Dietary Inflammatory Index (DII)	with increased risk of CIN2	inflammatory diet might be associated with an increased risk of CIN2 and more severe lesions
Korea : Sundara Raj Sreeja, et al; 2020[8]	Case-control study	1340 women (670 controls and 262, 187 and 221 patients with CIN1, CIN2/3, and cervical cancer, respectively)	Dietary glycemic index (GI) and glycemic load (GL)	Association with the risk of cervical intraepithelial neoplasia (CIN) and cervical cancer.	Dietary GI and GL may associated with increased risk of CIN1
Iran : Elham Nazari, et al; 2023[9]	case control	2088 healthy subjects and patients with cervical cancer	zinc, Iron, Niacin, Potassium, Phosphorous, and Cooper have a beneficial impact. Salt, snacks and milk Were identified as high-risk food factors	inhibiting and supporting factors causing cervical cancer	A diet and rich nutrition can be helpful for the prevention of cervix cancer and may reduce the risk of disease.

This research suggests that diet plays an important role in reducing the risk of HPV infection and cervical cancer. Research from Georgia suggests that consumption of fruits and vegetables rich in vitamin E and antioxidants may provide protection against the development of HPV and cervical cancer. This is because the protective properties of vegetables and fruits are low-molecular antioxidants that protect human cells and their structures against oxidative damage[10] . Fruit consumption on cervical cancer development has been reported to be similar to vegetables. According to Barchitta et al. stated that moderate adherence to the Mediterranean diet, which includes fruits, vegetables, nuts in addition to fats and oils, such as olive oil and fish oil, may decrease the likelihood of HR-HPV infection compared with low adherence (AOR = 0.40; 95% CI, 0.22-0.73) in a cross-sectional study. Then a study in China found a negative association between folate intake and risk of HPV infection, for every one mcg increase in folate intake, the incidence of HPV infection was reduced by 1% (OR = 0.99, $p<0.05$). RCS analysis confirmed the nonlinear

relationship between dietary folate intake and HPV infection risk. Notably, a significant inverse association was observed when dietary folate intake exceeded 193.847 mcg/day. In this regard, a case-control study by Kwanbunjan et al. reported that serum folate levels in cases of low-grade ($p < 0.01$) and high-grade ($p < 0.01$) cervical dysplasia were significantly lower compared to control women. This is because Folate (vitamin-9) has an important role in red blood cells, DNA synthesis, DNA repair, DNA methylation, and cell proliferation[10]. As well as the inverse linear relationship between vitamin E intake and the risk of HPV infection this is because vitamin E can protect cells from oxidative DNA damage and mutagenesis, thus preventing the development of some tumors[10]. Nutritionally, different antioxidants may have the ability to intervene in cervical disease with HPV infection. However, each vitamin may have a different suppression of cervical cancer development. In contrast, intake of vegetables and fruits containing multivitamins may suppress the development of cervical cancer to a large extent[10]. Research in Iran suggests that a nutrient-rich diet may aid in cervical cancer prevention. Overall, the combination of nutrient intake with antioxidant properties may reduce the risk of HPV infection. In addition, a proinflammatory diet is associated with an increased risk of more severe lesions, while a diet with a high glycemic (GI) and glycemic index (GL) is associated with an increased risk of CIN1 lesions. It is evident from several studies have stated that high carbohydrate intake results in increased IGF levels, which may amplify the appearance of cervical carcinogenesis. Then IGF stimulates mitogenic of epidermal growth factor in HT-3 cervical cancer cells, increasing cell proliferation. Increased carbohydrate consumption in the diet can alter metabolism as well as increase plasma levels of inflammatory biomarkers and disrupt glycogen synthesis, leading to metabolic changes[8].

CONCLUSION

The study reveals an association between diet and HPV infection and cervical cancer. Dietary patterns play an important role in reducing the risk of HPV infection and cervical cancer. This finding is supported by studies in various countries, including Georgia, China and Iran, which all show that combined intake of nutrients with antioxidant properties can reduce the risk of HPV infection and cervical cancer, as well as the importance of a healthy diet as an effective preventive measure.

AUTHORS' CONTRIBUTIONS

Alifia Nur Khahamidah performed conceptualization, methodology, resources, and writing-original. Fairuuz Diffa Rembune performed formal analysis, data curation, and writing-original. Almira Sitasari and Tri Siswati performed writing-review and editing, supervision, project administration, and funding acquisition.

DATA AVAILABILITY STATEMENT

No data was used for the research described in the article.

DISCLOSURE STATEMENT

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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