ABSTRACT

Objective: The objective of this article is to carry out a systematic review of scientific articles that reveal the risk factors associated with Barrett’s esophagus in hospitalized patients. Methods: The review was performed by electronic search for articles related to risk factors associated with Barrett’s esophagus in hospitalized patients. The PEO question was: What are the risk factors associated with Barrett’s esophagus in hospitalized patients? The search sources were in PUBMED. The search terms were: Risk Factors; Barrett’s esophagus; hospitalized patients. For this review, articles published from 2010 that had research experiences and theoretical-conceptual aspects were selected. Results: Of the 389 results found with indexing sources, a total of 25 articles were selected where 22 articles contained research results and 3 were considered for theoretical-conceptual aspects that are related to the purpose of the study. The search resulted in risk factors associated with Barrett’s esophagus according to demographic characteristics and patient traits, presentation, and clinical data and lifestyles. Conclusion: An association of various risk factors with Barrett’s esophagus is evidenced in hospitalized patients. The most concordant risk factors associated with Barrett’s esophagus in the review were male sex, increased age, metabolic syndrome, hiatal hernia, use of proton pump inhibitors, gastroesophageal reflux (GER), obstructive sleep apnea, and erosive esophagitis.

Key words: Risk Factors; Barrett’s esophagus; Patients (source: MeSH NLM).

RESUMEN

Objetivo: El objetivo de este artículo es realizar una revisión sistemática de artículos científicos que revelen los factores de riesgo asociados a Esófago de Barrett en pacientes hospitalizados. Métodos: La revisión fue efectuada mediante búsqueda electrónica de artículos relacionados a factores de riesgo asociadas a Esófago de Barrett en pacientes hospitalizados. La pregunta PEO fue ¿Cuáles son los factores de riesgo asociados a Esófago de Barrett en pacientes hospitalizados? Las fuentes de búsqueda fueron en PUBMED. Los términos de búsqueda fueron: Factores de Riesgo; Esófago de Barrett; pacientes hospitalizados. Para esta revisión se seleccionaron los artículos publicados a partir el año 2010 que tuvieron experiencias investigativas y aspectos teórico-conceptuales. Resultados: De los 389 resultados encontrados con fuentes de indexación, se seleccionaron un total de 25 artículos donde 22 artículos contenían resultados de investigación y 3 fueron considerados para aspectos teórico – conceptuales que se relacionan con el propósito del estudio. La búsqueda dio como resultado factores de riesgo asociados a Esófago de Barrett según las características demográficas y rasgos del paciente, presentación y datos clínicos y estilos de vida. Conclusion: Se evidencia una asociación de diversos factores de riesgo con Esófago de Barrett en pacientes hospitalizados. Los factores de riesgo asociados a Esófago de Barrett en la revisión que fueron más concordantes son sexo masculino, edad incrementada, síndrome metabólico, hernia hiatal, uso de inhibidores de bomba de protones, refluo gastroesofágico(RGE), apnea obstructiva del sueño y esofagitis erosiva.

Palabras clave: Factores de Riesgo; Esófago de Barrett; Pacientes (fuente: DeCS BIREME).
INTRODUCTION

At present, there are several risk factors for Barrett’s esophagus which have not been fully reviewed in hospitalized patients. Barrett’s esophagus is an acquired esophageal condition characterized by the presence of metaplastic columnar epithelium in the distal esophagus that replaces the normal stratified squamous mucosa. Factors associated with Barrett’s esophagus are symptoms of gastroesophageal reflux disease (GERD), advanced age, and male gender. Studies have revealed an association with central obesity (waist / hip ratio or abdominal circumference, but less clearly with body mass index or overall body fat content), smoking, Caucasian race, and a positive family history. In contrast, alcohol consumption does not appear to be a significant risk factor. Research has also found possible risk factors, such as metabolic syndrome, type 2 diabetes mellitus, and sleep apnea[1].

A potential mechanism of BE pathogenesis involves transdifferentiation, in which fully differentiated esophageal squamous cells change to fully differentiated columnar cells, either directly (without undergoing cell division) or indirectly (through cell division). Although once differentiated cells are considered immutable, studies have shown that differentiated cells can be reprogrammed to acquire characteristics of immature progenitor cells. Many types of mature cells have the ability to de-differentiate into cells with progenitor cell characteristics. Therefore, trans difference in the esophagus can occur through a 2-stage GERD process in an induced reprogramming in which mature squamous cells reverse their differentiation to acquire progenitor cell plasticity before changing to a columnar phenotype[2].

The diagnosis of Barrett’s esophagus should appear to be straightforward, that means, a visible change in the lining of the distal esophagus and histologic confirmation with columnar metaplasia. Diagnostic components of Barrett’s esophagus include endoscopic recognition, appropriately targeted biopsies, and histologic confirmation[3].

The objective of this article is to carry out a systematic review of scientific articles which reveal the risk factors associated with Barrett’s esophagus in hospitalized patients.

METHODS

A systematic search of electronic databases was carried out to identify publications related to risk factors for Barret’s esophagus, in the PUBMED indexing source. The PEO question was: What are the risk factors associated with Barret’s esophagus in hospitalized patients?

The advanced search terms for PUBMED were: Risk factors, Barret’s esophagus and patients. For this review, articles published with research results and those with theoretical-conceptual aspects since June 2010 and carried out in humans were selected with the help of the PUBMED advanced search. The systematic search used in PUBMED was: ((Patients[tiab] OR patient[tiab] OR Clients[tiab] OR Client[tiab]) AND (risk factors[tiab] OR Factor, Risk[tiab] OR Factors, Risk[tiab] OR Risk Factor[tiab] OR Population at Risk[tiab] OR Risk, Population at[tiab] OR Populations at Risk[tiab] OR Risk, Populations at[tiab] AND (Barrett Metaplasia[tiab] OR Barrett Metaplasias[tiab] OR Metaplasia, Barrett[tiab] OR Metaplasias, Barrett[tiab] OR Barrett’s Syndrome[tiab] OR barrett Syndrome[tiab] OR Barrett Syndrome[tiab] OR Barrett’s Esophagus[tiab] OR barrett Esophagus[tiab] OR Esophagus, Barrett's[tiab] OR Esophagus, Barrett[tiab] OR Barrett Epithelium[tiab] OR Epithelium, Barrett)). Figure 1 shows the process of selecting the terms for the systematic search.
The search resulted in risk factors associated with Barret's esophagus according to demographic characteristics and patient traits, presentation and clinical data, and lifestyles. Table 1 shows the risk factors for Barret's esophagus in hospitalized patients from observational cohort studies and selected cases and controls for the review article.

**RESULTS**

A total of 389 results were obtained in the systematic search found in PUBMED and a total of 25 articles were selected where 22 articles contained research results and 3 were considered for theoretical-conceptual aspects that are related to the purpose of the study. Figure 2 shows the article selection process in PUBMED.

**Figure 1.** Selection process of research and theoretical-conceptual articles for the review article in PUBMED

The search resulted in risk factors associated with Barret's esophagus according to demographic characteristics and patient traits, presentation and clinical data, and lifestyles. Table 1 shows the risk factors for Barret's esophagus in hospitalized patients from observational cohort studies and selected cases and controls for the review article.
Table 2. Risk factors for Barret’s esophagus in hospitalized patients from observational cohort and case-control studies.

| Measured risk factor | Author                          | Study type            | Article                                                                 | Population | Measurement value | CI 95%            | P       |
|----------------------|---------------------------------|-----------------------|--------------------------------------------------------------------------|------------|-------------------|------------------|---------|
|                      |                                 |                       | **Características demográficas y rasgos del paciente (edad, sexo, etnia, imc)** |            |                   |                  |         |
| Male patient         | Yousaf Bashir Hadi (4)          | cases and controls    | Independent association of obstructive sleep apnea with Barret’s esophagus | 1091       | OR:1.71           | 1.13–2.59        | <0.01   |
|                      |                                 |                       | Low Prevalence of Suspected Barrett’s Esophagus in Gastroesophageal Reflux Disease Without Alarm Symptoms | 4122       | OR:2.61           | 2.44–2.79        |         |
| Male patient         | Emery C Lin (5)                 | Cohort study          | Prevalence and risk factors for Barret’s esophagus in Taiwan             | 3385       | OR:2.106          | 1.145–3.872      | 0.017   |
| Male patient         | Yan-Hua Chen (6)                | Cohort study          | The influence of Helicobacter pylori on the ethnic distribution of Barret’s metaplasia | 596 479    | OR:3.34           | 3.28–3.40        | <0.0001 |
| Male patient         | A. Sonnenberg (7)               | cases and control     | Risk Factors for Barret’s Esophagus Compared Between African Americans and Non-Hispanic Whites | 1952       | OR:3.35           | 1.51–7.43        | 0.003   |
| Male patient         | Theresa H. Nguyen (8)           | cases and control     | Barrett’s esophagus in Latinos undergoing endoscopy for gastroesophageal reflux disease symptoms | 663        | OR:2.34           | 1.35–4.05        | 0.002   |
| Male patient         | Matheus Degiovani (90)          | cases and control     | Is there a relation between hellybacter pylori and intestinal metaplasia in short column epitelization up to 10 mm in the distal esophagus? | 373        | OR:1.76           | 1.13–2.76        | 0.013   |
| Male patient         | Matheus Degiovani (90)          | cases and control     | Independent association of obstructive sleep apnea with Barret’s esophagus | 1091       | OR:1.04           | 1.02–1.06        | <0.01   |
| Edad incrementada    | Yousaf Bashir Hadi (6)          | cases and control     | Influence of hiatal hernia and male sex on the relationship between alcohol intake and occurrence of Barret’s esophagus | 8031       | OR:1.42           | 1.23–1.64        | <0.0001 |
| Increased age | Matheus Degiovani(10) | Cases and control | IS THERE A RELATION BETWEEN HELYBACTER PYLORI AND INTESTINAL METAPLASIA IN SHORT COLUMN EPITELIZATION UP TO 10 MM IN THE DISTAL ESOPHAGUS? | 373 | OR: 1.017 | 1.001-1.033 | 0.031 |
| Increased age | Yan-Hua Chen(6) | Cohort study | Prevalence and risk factors for Barrett’s esophagus in Taiwan | 3385 | OR: 1.033 | 1.012-1.055 | 0.002 |
| Increased age | Rena Yadlapati(12) | Cohort study | Reduced Esophageal Contractility Is Associated with Dysplasia Progression in Barrett’s Esophagus: A Multicenter Cohort Study | 193 | OR: 1.08 | 1.01-1.16 | 0.03 |
| Increased age | Wytske M. Westra(13) | Cases and controls (Cigarette and smokeless tobacco users vs Non-users) | Smokeless Tobacco and Cigar and/or Pipe Are Risk Factors for Barrett Esophagus in Male Patients With Gastroesophageal Reflux Disease | 1015 | OR: 1.06 | 1.05-1.08 | <.001 |
| Increased age | Wytske M. Westra(13) | Cases and controls (cigarette and cigar users vs Non-users) | Smokeless Tobacco and Cigar and/or Pipe Are Risk Factors for Barrett Esophagus in Male Patients With Gastroesophageal Reflux Disease | 1015 | OR: 1.06 | 1.05-1.08 | <.001 |
| Increased age | A. Sonnenberg(7) | Cases and control | The influence of Helicobacter pylori on the ethnic distribution of Barrett’s metaplasia | 596479 | OR: 18.29 | 17.39–19.24 | <.0001 |
| Increased age | K. Keyashian(9) | Cases and control | Barrett’s esophagus in Latinos undergoing endoscopy for gastesophageal reflux disease symptoms | 663 | OR: 2.17 | 1.25–3.76 | 0.006 |
| Increased age | Gloria Vargas Cárdenas(14) | Cases and control | Esófago de Barrett: Prevalencia y Factores de Riesgo en el Hospital Nacional “Arzobispo Loayza” Lima-Perú | 11,970 | OR: 2.57 | 1.41-4.69 | 0.001 |
| Age 40 to 49 years | Emery C Lin(5) | Cohort study | Low Prevalence of Suspected Barrett’s Esophagus in Gastroesophageal Reflux Disease Without Alarm Symptoms | 4122 | OR: 1.32 | 1.18 - 1.47 |
| Age 50 to 59 years | Emery C Lin(5) | Cohort study | Low Prevalence of Suspected Barrett’s Esophagus in Gastroesophageal Reflux Disease Without Alarm Symptoms | 4122 | OR: 1.54 | 1.39 - 1.71 |
| Age 60 to 69 years | Emery C Lin\(^{(5)}\) | Cohort study | Low Prevalence of Suspected Barrett’s Esophagus in Gastroesophageal Reflux Disease Without Alarm Symptoms | 4122 | OR:1.68 | 1.51 - 1.87 |
|--------------------|----------------------|--------------|-------------------------------------------------------------------------------------------------|------|--------|-------------|
| Aqual to or greater than 70 years | Emery C Lin\(^{(5)}\) | Cohort study | Low Prevalence of Suspected Barrett’s Esophagus in Gastroesophageal Reflux Disease Without Alarm Symptoms | 4122 | OR:1.42 | 1.25 - 1.61 |
| BMI greater than 25 | Hirohiko Shinkai\(^{(15)}\) | Cases and controls | Association between the Body Mass Index and the Risk of Barrett’s Esophagus in Japan | 113 | OR:3.45 | 1.30–9.13 <0.01 |
| North european | A. Sonnenberg\(^{(7)}\) | Cases and controls | The influence of Helicobacter pylori on the ethnic distribution of Barrett’s metaplasia | 596 479 | OR:1.14 | 1.03–1.26 0.0117 |

**Presentation and clinical data (medical history)**

| Metabolic syndrome | Shou-Wu Lee\(^{(16)}\) | Cases and controls | Association of metabolic syndrome with erosive esophagitis and Barrett’s esophagus in a Chinese population | 7712 | OR:2.82 | 2.05–3.88 <0.001 |
| Metabolic syndrome | Cadman L. Leggett\(^{(27)}\) | Cases and controls BE VS with GERD | Metabolic Syndrome as a Risk Factor for Barrett Esophagus: A Population-Based Case-Control Study | 309 | OR:2 | 1.1–3.6 0.02 |
| Metabolic syndrome | Cadman L. Leggett\(^{(27)}\) | Cases and controls BE vs without GERD | Metabolic Syndrome as a Risk Factor for Barrett Esophagus: A Population-Based Case-Control Study | 309 | OR:1.9 | 1.03–3.6 0.04 |
| Central obesity | Chih-Cheng Chen\(^{(18)}\) | Cases and controls | Central Obesity and H. pylori Infection Influence Risk of Barrett’s Esophagus in an Asian Population | 161 | OR:2.79 | 1.89–4.12 <0.001 |
| Diabetes | K. Keyashian\(^{(9)}\) | Cases and controls | Barrett’s esophagus in Latinos undergoing endoscopy for gastresophageal reflux disease symptoms | 663 | OR:2.23 | 1.10–4.53 0.03 |
| Hiatal hernia | Camille Baziri\(^{(39)}\) | Cases and controls | Esophageal Motor Disorders Are a Strong and Independant Associated Factor of Barrett’s Esophagus | 201 | OR:5.60 | 2.45-12.76 < 0.001 |
| Hiatal hernia | Atsuhiro Masuda\(^{(37)}\) | Cohort study | Influence of hiatal hernia and male sex on the relationship between alcohol intake and occurrence of Barrett’s esophagus | 8031 | OR:3.37 | 2.50–4.59 <0.0001 |
| Hiatal hernia | Author(s) | Study Type | Description | Prevalence | OR Value | Confidence Interval | p Value |
|--------------|-----------|------------|-------------|------------|-----------|---------------------|--------|
| Low Prevalence of Suspected Barrett's Esophagus in Gastroesophageal Reflux Disease Without Alarm Symptoms | Emery C Lin(5) | Cohort study |  | 4122 | 1.60 | 1.50 - 1.70 | < 0.001 |
| Prevalence and risk factors for Barrett's esophagus in Taiwan | Yan-Hua Chen(6) | Cohort study |  | 3385 | 3.037 | 1.765 - 5.225 | < 0.001 |
| Risk factors for Barrett's esophagus in Indian patients with gastroesophageal reflux disease | Praveen Mathew(20) | Cases and controls |  | 278 | 3.14 | 1.2 - 8.17 | 0.01 |
| Risk Factors for Barrett's Esophagus Compared Between African Americans and Non-Hispanic Whites | Theresa H. Nguyen(8) | Cases and controls |  | 1952 | 5.08 | 3.35 - 7.69 | <0.001 |
| Risk Factors for Barrett's Esophagus Compared Between African Americans and Non-Hispanic Whites | Theresa H. Nguyen(8) | Cases and controls |  | 1952 | 2.79 | 1.85 - 4.19 | <0.001 |
| Association between the Body Mass Index and the Risk of Barrett's Esophagus in Japan | Hirohiko Shinkai(15) | Cases and controls |  | 113 | 18.3 | 7.21 - 46.5 | <0.01 |
| Risk Factors for Barrett's Esophagus Compared Between African Americans and Non-Hispanic Whites | Theresa H. Nguyen(8) | Cases and controls |  | 1952 | 1.73 | 1.10 - 2.73 | 0.02 |
| Risk Factors for Barrett's Esophagus Compared Between African Americans and Non-Hispanic Whites | Theresa H. Nguyen(8) | Cases and controls |  | 1952 | 1.88 | 1.40 - 2.52 | <0.001 |
| Association between the Body Mass Index and the Risk of Barrett's Esophagus in Japan | Hirohiko Shinkai(15) | Cases and controls |  | 113 | 8.28 | 2.96 - 123.1 | 0.01 |
| Risk factors for Barrett's esophagus in Indian patients with gastroesophageal reflux disease | Praveen Mathew(20) | Cases and controls |  | 278 | 2.28 | 1.11 - 4.66 | 0.02 |
### Motor disorder of the esophagus

| Authors | Study Design | Cases and Controls | Findings |
|---------|--------------|---------------------|----------|
| Camille Bazin | Cases and controls | Esophageal Motor Disorders Are a Strong and Independent Associated Factor of Barrett's Esophagus | OR: 4.49, 1.85-10.93, <0.001 |
| Yousaf Bashir Hadi | Cases and controls | Independent association of obstructive sleep apnea with Barrett's esophagus | OR: 2.23, 1.45-3.49, 0.01 |
| Cadman L. Leggett | Cases and controls | Obstructive Sleep Apnea Is a Risk Factor for Barrett's Esophagus | OR: 4.77, 1.57-14.02, <0.01 |
| Jiro Watari | Cases and controls | Association between obesity and Barrett's esophagus in a Japanese population: a hospital-based, cross-sectional study | OR: 3.48, 1.89-6.41, <0.0001 |
| Jiro Watari | Cases and controls | Association between obesity and Barrett's esophagus in a Japanese population: a hospital-based, cross-sectional study | OR: 5.67, 2.17-14.86, 0.0004 |

### Age of presentation of GER symptom under 30 years

| Authors | Study Design | Cases and Controls | Findings |
|---------|--------------|---------------------|----------|
| Omar Bakr | Cases and controls (Cases vs Population) | Gastroesophageal Reflux Frequency, Severity, Age of Onset, Family History and Acid Suppressive Therapy Predict Barrett's Esophagus in a Large Population | OR: 2.93, 1.67-5.15 |
| Omar Bakr | Cases and controls (Cases vs Patients with GER) | Gastroesophageal Reflux Frequency, Severity, Age of Onset, Family History and Acid Suppressive Therapy Predict Barrett's Esophagus in a Large Population | OR: 1.93, 1.15-3.22 |

### Nighttime symptoms of GER

| Authors | Study Design | Cases and Controls | Findings |
|---------|--------------|---------------------|----------|
| Omar Bakr | Cases and controls (Cases vs Population) | Gastroesophageal Reflux Frequency, Severity, Age of Onset, Family History and Acid Suppressive Therapy Predict Barrett's Esophagus in a Large Population | OR: 5.40, 3.81-7.72 |

### Feeling stuck

| Authors | Study Design | Cases and Controls | Findings |
|---------|--------------|---------------------|----------|
| Omar Bakr | Cases and controls (Cases vs Population) | Gastroesophageal Reflux Frequency, Severity, Age of Onset, Family History and Acid Suppressive Therapy Predict Barrett's Esophagus in a Large Population | OR: 3.00, 2.13-4.24 |
| Family history | Cases and controls (Cases vs Population) | Gastroesophageal Reflux Frequency, Severity, Age of Onset, Family History and Acid Suppressive Therapy Predict Barrett's Esophagus in a Large Population | OR: 2.55 | 1.80-3.62 |
|----------------|----------------------------------------|--------------------------------------------------------------------------------|----------|-----------|
| BE family history | Cases and controls (Cases vs Population) | Gastroesophageal Reflux Frequency, Severity, Age of Onset, Family History and Acid Suppressive Therapy Predict Barrett's Esophagus in a Large Population | OR: 10.08 | 2.83-35.84 |
| BE family history | Cases and controls (Patients with GER) | Gastroesophageal Reflux Frequency, Severity, Age of Onset, Family History and Acid Suppressive Therapy Predict Barrett's Esophagus in a Large Population | OR: 3.64 | 1.50-8.83 |
| 1-2 appointments per year for GER | Cases and controls (Cases vs Population) | Gastroesophageal Reflux Frequency, Severity, Age of Onset, Family History and Acid Suppressive Therapy Predict Barrett's Esophagus in a Large Population | OR: 7.13 | 4.71-10.81 |
| More than 3 appointments per year for GER | Cases and controls (Cases vs Population) | Gastroesophageal Reflux Frequency, Severity, Age of Onset, Family History and Acid Suppressive Therapy Predict Barrett's Esophagus in a Large Population | OR: 5.12 | 2.96-8.83 |
| 3-5 appointments per year for any reason | Cases and controls (Cases vs Population) | Gastroesophageal Reflux Frequency, Severity, Age of Onset, Family History and Acid Suppressive Therapy Predict Barrett's Esophagus in a Large Population | OR: 2.06 | 1.40-3.03 |
| 6-10 appointments per year for any reason | Cases and controls (Cases vs Population) | Gastroesophageal Reflux Frequency, Severity, Age of Onset, Family History and Acid Suppressive Therapy Predict Barrett's Esophagus in a Large Population | OR: 2.69 | 1.65-4.37 |
| Risk Factor                                    | Study Description                          | Study Type | Study Details                                                                 | p-Value | Odds Ratio (OR) | 95% Confidence Interval          |
|-----------------------------------------------|--------------------------------------------|------------|-------------------------------------------------------------------------------|---------|-----------------|----------------------------------|
| More than 10 visits per year for any reason   | Omar Bakr                                  | Cases and controls (Cases vs Population) | Gastroesophageal Reflux Frequency, Severity, Age of Onset, Family History and Acid Suppressive Therapy Predict Barrett’s Esophagus in a Large Population |         | 2.25            | 1.33–3.83                       |
| Human papillomavirus DNA                      | M. YW Wong                                  | Cases and controls | Human papillomavirus exposure and sexual behavior are significant risk factors for Barrett’s dysplasia/esophageal adenocarcinoma |         | 8.2             | 2.8–23.8 0.0001                 |
| Obstructive sleep apnea                       | Yousaf Bashir Hadi                         | Cases and controls | Independent association of obstructive sleep apnea with Barrett’s esophagus |         | 3.26            | 1.72–6.85 0.01                 |
| Obstructive sleep apnea                       | Cadman L. Leggett                          | Cases and controls | Obstructive Sleep Apnea Is a Risk Factor for Barrett’s Esophagus              |         | 1.8             | 1.1–3.2 0.03                   |
| Erosive esophagitis                           | Atsuhiro Masuda                            | Cohort study | Influence of hiatal hernia and male sex on the relationship between alcohol intake and occurrence of Barrett’s esophagus |         | 2.82            | 2.04–3.85 0.0001               |
| Erosive esophagitis                           | Hirohiko Shinkai                           | Cases and controls | Association between the Body Mass Index and the Risk of Barrett’s Esophagus in Japan |         | 15.3            | 3.49–66.8 0.01                |
| Esophagitis                                   | Gloria Vargas Cárdenas                     | Cases and controls | Esófago de Barrett: Prevalencia y Factores de Riesgo en el Hospital Nacional “Arzobispo Loayza” Lima-Perú |         | 14.81           | 3.96–55.41 0.001             |
| Grade B esophagitis (LA)                      | Emery C Lin                                | Cohort study | Low Prevalence of Suspected Barrett’s Esophagus in Gastroesophageal Reflux Disease Without Alarm Symptoms |         | 2.19            | 1.72 - 2.78                    |
| Grade C / D esophagitis (LA)                  | Emery C Lin                                | Cohort study | Low Prevalence of Suspected Barrett’s Esophagus in Gastroesophageal Reflux Disease Without Alarm Symptoms |         | 3.50            | 2.59 - 4.73                    |
| Premature birth                               | Seiji Shiota                               | Cohort study | Premature Birth and Large for Gestational Age Are Associated with Risk of Barrett’s Esophagus in Adults |         | 4.08            | 1.38 - 12.05                   |
### Lifestyle (sexual intercourse, consumption of food and drink, tobacco, alcohol)

| Lifestyle Factor                                | Reference                     | Study Design          | Cases and Controls Description                                                                 | N    | OR    | 95% CI   | P-value |
|------------------------------------------------|------------------------------|-----------------------|---------------------------------------------------------------------------------------------|------|-------|----------|---------|
| Person in a sexual relationship                 | M. YW Wong (24)              | Cases and controls    | Human papillomavirus exposure and sexual behavior are significant risk factors for Barrett’s dysplasia/esophageal adenocarcinoma | 133  | 11.4  | 1.4–93.9 | 0.02    |
| More than 6 oral sex partners                   | M. YW Wong (24)              | Cases and controls    | Human papillomavirus exposure and sexual behavior are significant risk factors for Barrett’s dysplasia/esophageal adenocarcinoma | 133  | 4.0   | 1.2–13.7 | 0.046   |
| Alcohol consumption                             | Atsuhiro Masuda (11)         | Cohort study          | Influence of hiatal hernia and male sex on the relationship between alcohol intake and occurrence of Barrett’s esophagus | 8031 | 1.92  | 1.41–2.61| <0.0001 |
| Hot tea consumption                             | Yan-Hua Chen (6)             | Cohort study          | Prevalence and risk factors for Barrett’s esophagus in Taiwan                               | 3385 | 1.695 | 1.043–2.754| 0.033   |
| Always use a cigarette                         | Wytske M. Westra (13)        | Cases and controls    | Smokeless Tobacco and Cigar and/or Pipe Are Risk Factors for Barrett Esophagus in Male Patients With Gastroesophageal Reflux Disease | 1015 | 1.43  | 1.06–1.88 | 0.02    |
| Always use cigarettes and smokeless tobacco    | Wytske M. Westra (13)        | Cases and controls    | Smokeless Tobacco and Cigar and/or Pipe Are Risk Factors for Barrett Esophagus in Male Patients With Gastroesophageal Reflux Disease | 1015 | 2.53  | 1.22–5.22 | 0.01    |
| Always use a cigarette                         | Wytske M. Westra (13)        | Cases and controls    | Smokeless Tobacco and Cigar and/or Pipe Are Risk Factors for Barrett Esophagus in Male Patients With Gastroesophageal Reflux Disease | 1015 | 1.43  | 1.07–1.91 | 0.02    |
| Always consume cigarette and cigar             | Wytske M. Westra (13)        | Cases and controls    | Smokeless Tobacco and Cigar and/or Pipe Are Risk Factors for Barrett Esophagus in Male Patients With Gastroesophageal Reflux Disease | 1015 | 1.90  | 1.03–3.58 | 0.04    |
| Consumption of fatty foods                     | Gloria Vargas Cárdenas (14)  | Cases and controls    | Esófago de Barrett: Prevalencia y Factores de Riesgo en el Hospital Nacional “Arzobispo Loayza” Lima-Perú | 11,970 | 8.67  | 2.28–32.99 | 0.001   |
The most consistent risk factors in the articles reviewed are male, increased age, metabolic syndrome, hiatal hernia, use of proton pump inhibitors, gastroesophageal reflux (GER), obstructive sleep apnea and erosive esophagitis. Central obesity, diabetes, active gastritis, presence of belching, esophageal motor disorder, human papillomavirus DNA, alcohol consumption, tobacco use, consumption of hot tea and consumption of fatty foods are risk factors with only one study showing confirms the association with Barret’s esophagus, which should be further studied.

DISCUSSION

According to the demographic characteristics, for several authors, being a male is a risk factor for Barret’s esophagus\(^{4,5,6,7,8,9}\). Although Matheus Degiovani et al, say that being a female is a risk factor for Barret’s esophagus\(^{10}\).

According to many authors, increased age is a risk factor\(^{4,6,7,8,9,10,11,12,13,14}\). Although Emery C Lin et al, found that the OR increases constantly from 40 years to 69 years where their OR is 1.68\(^{15}\).

With regard to presentation and clinical data, according to Shou-wu Lee et al and Cadman L. Leggett et al, metabolic syndrome is a risk factor for Barret's esophagus\(^{16,17}\).

Other authors have found other components of the metabolic syndrome triad as risk factors, such as Chih-Cheng Chen et al, who mentioned that central obesity is a risk factor for Barret’s esophagus\(^{18}\).

According to several authors, hiatal hernia is a risk factor for Barret’s esophagus\(^{5,6,11,19,20}\). Although Theresa H. Nguyen distinguishes the size of the hiatal hernia considering that one greater than or equal to 3 cm is more likely to have Barret’s esophagus.8

According to Yousaf Bashir Hadi et al, Cadman L. Leggett et al and Jiro Watari et al, GER is a risk factor for Barret’s esophagus\(^{6,21,22}\). Although Omar Bakr et al, mentions that both the age of presentation, symptoms, family history and the number of consultations made for GER could also be risk factors\(^{23}\). Furthermore, Theresa H. Nguyen et al and Hirohiko Shinkai et al , tells us that the use of proton pump inhibitors is a risk factor for Barret’s esophagus\(^{8,15}\).

Conforming to Yousaf Bashir Hadi et al, Cadman L. Leggett et al, obstructive sleep apnea is a risk factor for Barrett’s esophagus\(^{6,21}\). According to Atsuhiro Masuda et al and Hirohiko Shinkai et al, erosive esophagitis is a risk factor for Barret’s esophagus\(^{11,15}\). Although for Gloria Vargas Cárdenas et al, only the fact of having esophagitis would already be a risk factor\(^{14}\), on the other hand for Emery C Lin et al, they mention that only grade B, C, D esophagitis are a risk factor for Barret's esophagus.5 Lifestyles are not as well studied as a risk factor for which more studies should be carried out.

CONCLUSION

An association of multiple risk factors with Barret’s esophagus is evidenced in hospitalized patients. The risk factors associated with Barret’s esophagus in the review that were the most concordant are male sex, increased age, metabolic syndrome, hiatal hernia, use of proton pump inhibitors, gastroesophageal reflux (GER), obstructive sleep apnea and erosive esophagitis.

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