Sandra Lucia Montaño Rodriguez

Lip, Oral cavity and Pharyngeal Cancer Prevalence/Incidence in Less developed countries - Systematic search and narrative review

Universidade Fernando Pessoa
Faculdade Ciências da Saúde
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Dissertação apresentada à Universidade Fernando Pessoa como parte dos requisitos para obtenção do grau de Mestre em Medicina Dentária sob orientação da Profª Doutora Conceição Manso

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(Sandra Lucia Montaño Rodriguez)

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I dedicate this thesis to my grandmother and her memory, because she lives every day with me for her heritage and courage all her life.

I am grateful to all my parents for having supported me and help me to become who I am and help me with my daughters all really appreciate it. I am grateful to my two brothers and their families. They all have a special place in my heart.

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Abstract

Objective. The aim of this study was to conduct a systematic review of the available literature on the prevalence / incidence of labial, oral and pharyngeal cancer in the less developed countries and its approach from 2010-2020.

Methodology: A systematic review was performed on PubMed, EBSCO, Web-of-Science and Scielo following the PRISMA statement. Articles were selected based on inclusion and exclusion criteria. The level of evidence was classified based on the Levels of evidence of the National Health and Medical Research Council.

Results: 8638 articles were obtained, duplicate article eliminated, but only four papers and one database were included for final analysis, and were from Tanzania, Mozambique, Bangladesh, and Nepal. Higher incidence/prevalence of LOCP was found for male and for middle age groups.

Conclusion: The lip, oral and pharyngeal cancer LOCP incidence and prevalence showed increase values in low income countries, particularly for men and for middle age groups.

Keywords: *«lip cancer», »oral cancer», «pharyngeal cancer», «prevalence cancer» «incidence pharyngeal cancer». «low-income».*

Sumário

Objetivo. O objetivo deste estudo foi realizar uma revisão sistemática da literatura disponível sobre a prevalência/incidência de cancro labial, oral e faríngeo (LOCP) nos países menos desenvolvidos e a sua abordagem desde 2010-2020.

Metodologia. Foi realizada uma revisão sistemática através da PubMed, EBSCO, Web of Science e Scielo, seguindo a declaração PRISMA. A seleção dos artigos finais foi baseada em critérios de inclusão e exclusão. O nível de evidência do trabalho foi avaliado com base nos Níveis de evidência do Conselho Nacional de Saúde e Pesquisa Médica.

Resultados. Foram obtidos 8638 artigos, os artigos duplicados foram eliminados, e apenas quatro artigos e uma base de dados foram incluídos, com respeito à Tanzânia, Mozambique, Bangladesh e Nepal. Foi detetada uma maior incidência/prevalência LOCP em homens e para a faixa etária adulta madura.

Conclusão. A incidência e prevalência de LOCP apresentaram valores crescentes em países de baixa renda, principalmente para homens e meia-idade.

Palavras-chave: *«câncer de lábio», «câncer bucal», «câncer faríngeo», «prevalência de câncer de faringe», «incidência de câncer faríngeo», «baixa renda»*.

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ABBREVIATIONS

LOCP	Lip, oral cavity, and pharyngeal cancer
IARC	International Agency for Research on Cancer
WHO	World Health Organization
GNI	Gross national income
LDC	Less-developed countries
PRISMA	Preferred reporting items for Systematic Review
APC	Annual Percent Change
ARB	Accumulative Risk Birth
HDI	Human Development Index by United Nations Classification
UI	Uncertainty Interval
CR	Crude Ratio
Prop	Proportion
HPV	Human Papillomavirus

1. Background

Lip, oral cavity and pharyngeal cancer (LOCP) is an important and growing problem in many parts of the world (Curado *et al.*, 2016; Diz *et al.*, 2017; Perea *et al.*, 2018; Ellington *et al.*, 2020; Miranda-Filho and Bray, 2020). The worldwide incidence cases of LOCP cancer in 2012 were 529,500 and 292,300 deaths (Shield *et al.*, 2017) .

In 2015 the number of new cases increasing 571,386 of the disease and 316,168 deaths according to the International Agency for Research on Cancer (IARC) (Perea *et al.*, 2018) and in 2018 registered seventh for incidence and eighth cancer mortality (Ferlay *et al.*, 2019). Incidence and mortality are twice as high in men (2.3% and 1.7%, respectively) compared to women (1.2% and 0.8%, respectively) (Lousada-Fernandez and Rapado-Gonzalez, 2018).

However, the incidence of LOCP has been presenting a geographic variation, areas characterised with high incidence rates include south and south-east Asia (Sri Lanka, India, Pakistan, Taiwan), parts of western and eastern Europe (France, Hungary Slovakia, Slovenia), parts of Latin America and the Caribbean (Brazil, Uruguay, Puerto Rico) and in pacific regions (Papua New Guinea and Melanesia) (Warnakulasuriya, 2009; Olaleye *et al.*, 2015; Du *et al.*, 2020).

An important variation in the pattern of oral and oropharyngeal cancer incidence and prevalence in different parts of the world reflects the importance of socio determinants factors (Zini *et al.*, 2009; Elstad, 2017). The changes in the prevalence and distribution of the main risk factors for cancer were associated with socioeconomic development (Bray, Ferlay and Soerjomataram, 2018). One example of this is United States of America incidence of combined oral cavity and pharyngeal cancers declined during the 1980s but began to increase around 1999 (Simard *et al.*, 2012). In that specific period tobacco use had declined in the USA, accompanied by a decrease in incidence of many tobacco related cancers. Researchers have suggested that the increase in oral cavity and pharynx cancers might be dependent on race, ethnicity, gender, age group, income, behavioural habits, and anatomic site (Ellington *et al.*, 2020).

Three principles of action of Social Determinants of Health are: a) Improve the conditions of daily life – the circumstances in which people are born, grow, live, work, and age. b) Tackle the inequitable distribution of power, money, and resources – the structural drivers of those conditions of daily life – globally, nationally, and locally. c) Measure the problem, evaluate

action, expand the knowledge base, develop a workforce that is trained in the social determinants of health, and raise public awareness about the social determinants of health (Commission on Social Determinants of Health, 2008; World Health Organization, 2014).

The enormous influence of income on health cannot be ignored (Marmot, 2002, 2017; Wilkinson and Marmot, 2003; Frcp and Bell, 2016). Income is related to health in three ways: through the gross national product of countries, the income of individuals, and the income inequalities among rich nations and among geographic areas. A central question is the degree to which these associations reflect a causal association (Marmot, 2002). Any comprehensive assessment of inequality must consider income and wealth (UNDP, 2019).

The World Bank has used an income classification to group countries for analytical purposes for many years (Neil and Umar, 2016). The income classification since 1989, divides countries into four groups: low income, lower middle income, upper middle income, and high income by using gross national income (GNI) per capita. GNI is valued annually in US dollars using a three-year average exchange rate. It is important to mention GNI per capita does not completely summarize a country's level of development or measure welfare, it amply proved to be a useful and easily available indicator that is closely correlated with other nonmonetary measures of the quality of life, such as life expectancy at birth, mortality rates of children, and enrolment rates in school.

Less-developed countries (LDC) are low-income countries that face significant structural challenges to sustainable development (Rolf Traeger, 2019; United Nations, 2019). United Nations currently designated to forty-seven countries by least developed countries these are: Afghanistan, Angola, Bangladesh, Benin, Bhutan, Burkina Faso, Burundi, Cambodia, the Central African Republic, Chad, the Comoros, the Democratic Republic of the Congo, Djibouti, Eritrea, Ethiopia, the Gambia, Guinea, Guinea-Bissau, Haiti, Kiribati, the Lao People's Democratic Republic, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Myanmar, Nepal, the Niger, Rwanda, Sao Tome and Principe, Senegal, Sierra Leone, Solomon Islands, Somalia, South Sudan, the Sudan, Timor-Leste, Togo, Tuvalu, Uganda, the United Republic of Tanzania, Vanuatu, Yemen and Zambia (Program, 2017).

Understand cancer worldwide and their profiles across human development levels, it is an important insight into the distribution of cancer cases (Conway *et al.*, 2008; Arnold *et al.*, 2016; Teng *et al.*, 2017). The global incidence of LOCP (excluding nasopharyngeal cancers) increased significantly over the 28-years study period, especially in women, those in younger

age groups, and people in low/middle-income areas (Du *et al.*, 2020). This study aims to examine the prevalence and incidence of lip, oral, and pharyngeal cancer in the least developed countries and their different sociodemographic factors.

2. Method

2.1. Protocol and registration

The systematic search was done in compliance with the preferred reporting items for Systematic Review (PRISMA) checklist (Moher *et al.*, 2015; Shamseer *et al.*, 2015).

2.2. Eligibility criteria

Publications

a. English, Spanish, Portuguese written, and published articles included were peer reviewed and published in an indexed scientific journal.

b. Period between of January 2010 and June 2020.

c. Grey literature was not included.

Study characteristic

Participants

a. Studies about patients diagnosed with cancers of the lip, tongue and oral cavity, codes (ICD-10:C00-C06) and of the oropharynx (ICD-10:C09, C10 and C14), Hypopharynx cancer (C12-13) Oesophagus (C15) and Larynx cancer (C32).

b. It was a must for the participants in the selected studies to be habitant in low income countries.

c. No age limits and gender.

d. Studies about animals were excluded.

Study type and design

a. Retrospective and prospective cohort, case control and cross-sectional studies.

b. Randomized controlled trials and controlled trials without randomization were excluded.

c. Systematic reviews, editorials and meta-analysis were excluded.

2.3. Information sources

We controlled vocabulary (Mesh terms) and free keywords in the search strategy were defined based on the population who lives in low-income countries with LOCPs. The searched electronic databases were PubMed, EBSCO, Web of Science and Scielo.

2.4. Search strategy

The search standardized terms and keywords that were used to identify potentially relevant studies in the databases were as follow: ((((("oropharyngeal neoplasms"[MeSH Terms] AND ("oropharyngeal neoplasms"[MeSH Terms] OR ("oropharyngeal"[All Fields] AND "neoplasms"[All Fields]) OR "oropharyngeal neoplasms"[All Fields])) AND ("epidemiology"[Subheading] OR "epidemiology"[All Fields] OR "prevalence"[All Fields] OR "prevalence"[MeSH Terms]) OR "incidence"[All Fields] OR "incidence"[MeSH Terms])) AND ("less developed countries" [MeSH Terms] OR ("least developed countries"[MeSH Terms] OR "less developed"[All Fields]) OR "least developed"[All Fields] NOT "developed countries")))).

2.5. Study selection

After performing the initial search strategy, a study selection was carried out following a step-by-step process order illustrated in Fig.1.

a. Duplicate references were removed using the Mendeley Desktop Version 1.19.4. It is important to mention we realized of the intensiveness hand-searching that is a manual method of scanning select journals from cover to cover for relevant articles in case they were missed during indexing in the initial insertion for this systematic review.

b. Title and abstract screening articles, in this stage we are following the inclusion and exclusion criteria for this study.

c. Full-text screening, in this stage after select articles, we choose the articles by title and abstract to ascertain the eligibility of articles against the decided inclusion criteria.

d. Selected definitive articles and collected the data individually and cross-checked the information about country, study design, participants type of LOCP, prevalence value.

2.6. Data collection process

Reported Prevalence or Incidence analyse in low income countries in oral and pharyngeal cancers

To answer this question, two concepts should be explained (Klein and Klein, 1980). The **cancer incidence** rate is the number of new cancers of a specific site/type occurring in a specified population during a year, usually expressed as the number of cancers per 100 000 population at risk.

Calculary Incidence rate= (New cancers in a period of 1 year/ Population at risk) x 100 000

Prevalence of cancer is defined as the number or percent of people alive on a certain date in a population who previously had a diagnosis of the cancer. It includes new cases (incidence) and pre-existing cases and is a function of both past incidence and survival. The mathematical way to calculate this would be:

Prevalence= (New and pre-existing cancers/ Population) x 100 000
The aim of analyse prevalence is to elaborate health planning, resource allocation and estimate of cancer survivorship**.**

This study built an entry list to apply data that were considered significant, from each selected article. The points to consider relevant to critical appraisal were:

(i) Study: Author, publication year, study place, study type, level evidence, study design, main findings.

(ii) Participants characteristics: study, gender, age (range or median), reported prevalence.

(iii) Type of the LOCP by codes (ICD-10:C00-C06) and of the oropharynx (ICD-10:C09, C10 and C14 by all the selected articles.

(iv) Type of the LOCP by codes (ICD-10:C00-C06) and of the oropharynx (ICD-10:C09, C10 and C14 in low income countries based GLOBAN registers.

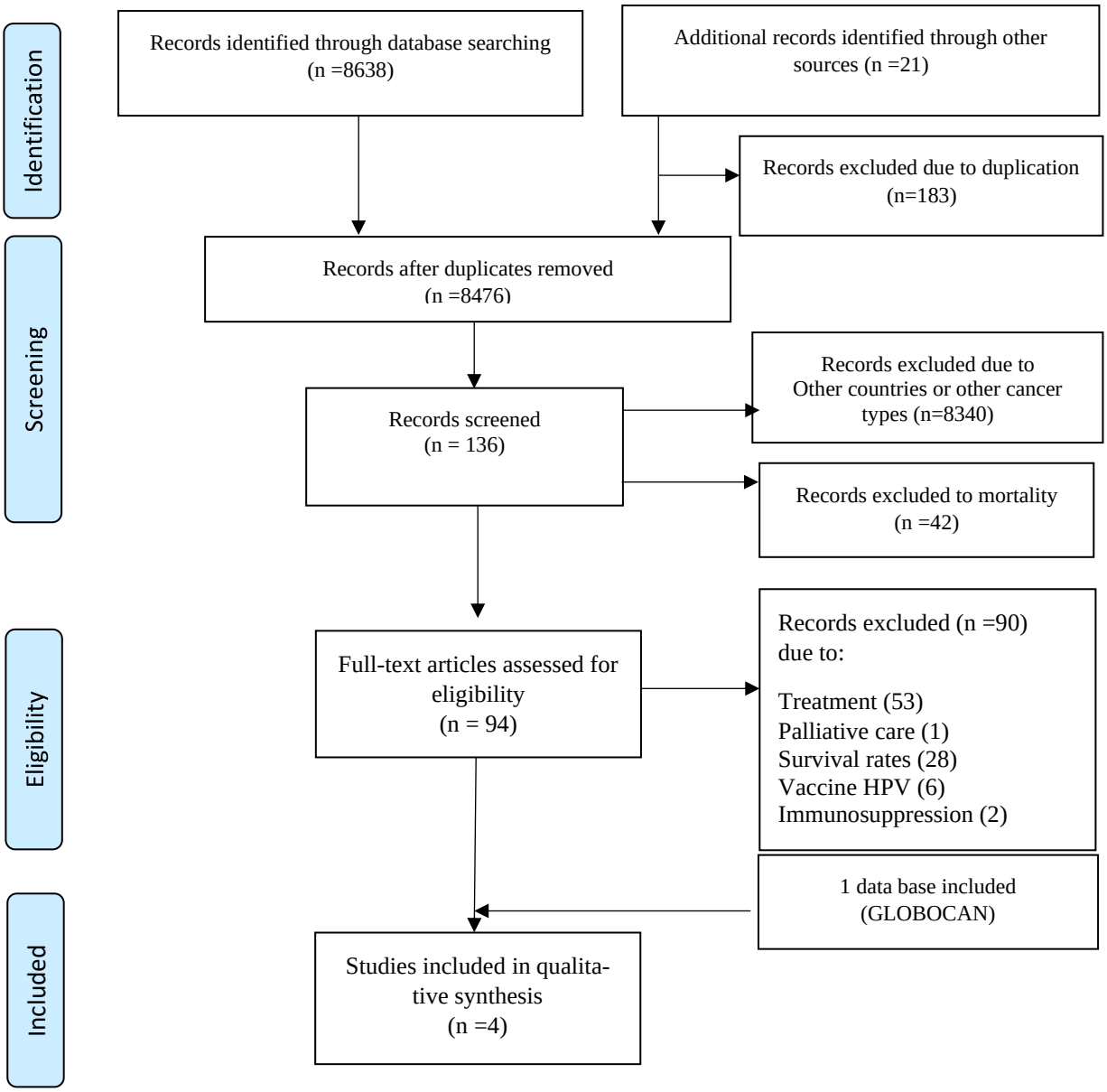

Figure 1. PRISMA Study flow diagram

Methodology quality assessment

The studies were included following eligibility criteria for including studies in the review a Methodological Expectations of Cochrane Intervention Reviews (MECIR) (Higgins *et al.*, 2016).

3. Results

Our search strategy identified 8638 citations using the specified search in May 2020. We included 21 records other resources, 183 were excluded duplicates records. Different phases concluded in a final selection of four studies, as the illustrated in Figure 1.

Table 1. Characteristics of Related Studies Included

Author,	Year	Country	Study type	Level of evidence	Study design	Main findings
(Campbell *et al.*, 2016)	2016	Tanzania	Retrospective	III-3	Comparative study with outcomes	Data collected from medical records: sex, age region of residence, tobacco and alcohol use, history of comorbidities, HIV status, cancer type, cancer stage, date of cancer diagnosis, cancer treatment, cancer recurrence, subsequent cancer diagnoses and recorded death/mortality
(Lorenzoni *et al.*, 2018)	2018	Mozambique	Retrospective	III-3	Retrospective Cohort study	Data collected by two cancer surveys in two periods 1956–1961 and 1991–2008 in Maputo by medical records and pathology laboratory registers. The surveys registered alcohol consumption tobacco, cereal based diets, corn and nutritional deficiencies.
(Shaikh *et al.*, 2017)	2017	Bangladesh	Retrospective	III-3	Retrospective Cohort study	Data collected by Dhaka Medical College Hospital who were diagnosticated with Oral and pharyngeal cancer and their association of HPV- in Bangladesh.
(Poudel, Huang and Neupane, 2016)	2016	Nepal	Retrospective	III-3	Retrospective Cohort study	Data collected by hospital based National cancer registry programme of Nepal were used to calculate the age specific incidence of five major cancers by sex and sites

Table 2. Participants characteristics: study, gender, age (range or median), reported prevalence/incidence

Author	Male/ Female	Lip and oral cavity cancers (C00-06)	Salivary glands (C07-08)	Oropharynx cancer (C09-10)	Nasopharynx (C11)	Hipopharynx cancer (C12-13)	Oesophagus (C15)	Larynx (C32)	Main conclusions
(Campbell *et al.*, 2016)	N=1513 M=1002 (66,2%) F=511 (33.8%)	N= 421 M=262 (62.2%) F= 159 (37.8%) Mean age 56.6 ± 15.2 Co-morbidities Mean count ± SD: 0.37 ± 0.65			N= 230 M=132 (57.4%) F= 98 42.6%) Mean age 47.9 ± 16.6 Co-morbidities Mean count 0.34 ± 0.67	N = 224 M=185(82,6%) F= 39 (17.4 %) Mean age 59.3 ± 13.4 Co-morbidities Mean count 0.34 ± 0.63	No Data	No Data	Nearly twice that percent of males were diagnosed with head and neck cancer compared to females. Patients who had previously smoked present head and neck cancer (40.4% and 54.5% respectively) and who previously consumed alcohol presented head (43.2% and 48.2%) respectively).
(Lorenzoni *et al.*, 2018)	N= 600 M= 403 (67.2%) F=197 (32.8%)	Age-standardised rate per 100 000 1956–1961 M=3.8 F = 4.8 2003–2008 M= 4.8 F= 4.5			No Data	No Data	Age standarized rate per 100 000 1956–1961 M=3.2 F = No data 2003–2008 M= 8.7 F= 9.9	No data	Increase the incidence of LOCP in men and decrease in women. The changes in the cancer profile should be expected in LOCP in the upcoming years, due to the constant growth of population, the higher life expectancy, and the increased prevalence of socio-determinants of health such as education and access.
(Shaikh *et al.*, 2017)	N= 174 M=138 (79.3%) F=36 (20.7%)	N= 55 P value 0.038 HPV^+ 11(30.6%) HPV^-44/55 44 (31.9%)	No data	N= 35 HPV+ 13 (36.1%) HPV – 22/35 22 (15.9%)	No data	N=20 HPV+ 4 (11.1%) HPV – 16/20 16 (11.6%)	No data	N= 64 (36.8%) HPV+ 8 (22.2%) HPV –56/64 (40.6%)	Human Papillomavirus (HPV) is associated with and probably responsible for ~21% of Head and Neck squamous cell carcinoma (HNSCC) in Bangladesh. HPV+ age Mean ~54 years, p = 0.014 HPV+ HPV– age Mean ~ 57 years, p = 0.011 HPV-
(Poudel, Huang and Neupane, 2016)	N= 7212	No data	No data	No data	No data	No data	No data	Age incidence per ratio per 100 000 in males 1.31 70-74 age groups had highest cancer incidence (188.08)	Head and Neck were the most common types of cancers and larynx was the third most common cancer crude incidence) for male in Nepal.

APC Annual Percent Change; ARB Cumulative Risk Birth; HDI Human Development Index by United Nations Classification; HPV Human Papillomavirus

Table 3. GLOBOCAN 2018 REGISTERS PREVALENCE - Estimated number of prevalent cases in 2018

Country	Gender	Lip and oral cavity cancers (C00-06)	Salivary glands (C07-08)	Oropharynx cancer (C09-10)	Nasopharynx (C11)	Hipopharynx cancer (C12-13)	Oesophagus (C15)	Larynx (C32)	Main findings
Bangladesh	M/F	27 631 P 16.6	1 587 P 0.95	8563 P 5.1	1 951 P 1.2	8 504 P 5.1.	19 662 P 11.8	10 185 P 6.1.	The higher prevalence is Lip and Oral cavity cancers
Mozambique	M/F	28 004 P 2.1.	9.522 P 0.72	5 878 P 0.45	22.820 P 1.7	2 445 P 0.19	27.658 P 2.1	21 714 P 1.6	The higher prevalence is Lip and Oral cavity cancers
Nepal	M/F	2 438 P 8.2	292 P 0.99	535 P 1.8	502 P 1.7	312 P 1.1.	526 P 1.8	1 228 P 4.1.	The higher prevalence is Lip and Oral cavity cancers
United Republic of Tanzania	M/F	29 761 P 2.2	9466 P 0.70	5.936 P 0.44	23 945 P 1.8	2 747 P 0.20	28 976 P 2.2	22 363 P 1.7	The higher prevalence is Lip and Oral cavity cancers

UI= Uncertainty Interval / CR= Crude Ratio /ASR World / P Proportion per 100 000

Table 4**. GLOBOCAN 2018 REGISTERS INCIDENCE** Crude and age-standardized rates per 100 000

Country	Gender	Lip and oral cavity cancers (C00-06)	Salivary glands (C07-08)	Oropharynx cancer (C09-10)	Nasopharynx (C11)	Hipopharynx cancer (C12-13)	Oesophagus (C15)	Larynx (C32)	Main findings
Bangladesh	M/F	13,401 ICI 8,515.7-21,088.8 CR 8.1	849 ICI 229.5-3140.9 CR 0.51	3,667 ICI 1649.6-8151.7 CR 2.2	845 ICI 346.4-2061.5 CR 0.51	7099 ICI 2,839.0-17,751.0 CR 4.3	20 906 ICI 15,577.4-28057.3 CR 12.6	4996 ICI 2638.7 – 9459.3 CR 3.0	The higher incidence is Oesophagus
Mozambique	M/F	297 ICI 180.5-488.6 CR 0.97	240 ICI 145.9-394.9 CR 0.79	114 ICI 54.5-238.6 CR 0.37	41 ICI I7.9-213.8 CR 0.13	No data	1 056 ICI 822.1-1356.4 CR 3.5	224 ICI 131.1-382.8 CR 0.73	The higher incidence is Oesophagus
Nepal	M/F	1,207 ICI 786.1-1853.3 CR 4.1	160 ICI 78.4-326.6 CR 0.54	246 ICI 142.1-425.8 CR 0.83	222 ICI 139.5-353.3 CR 0.75	281 ICI 135.1-584.6 CR 0.95	565 ICI 395.9-806.3 CR 1.9	572 ICI 348.6 – 938.5 CR 1.9	The higher incidence is Lip and Oral cavity cancers
Tanzania	M/F	1098 ICI 686.2 – 1756.9 CR 1.9	178 ICI 98.1 -323.1 CR 0,30	115 ICI 46.7- 283.3 CR 0.19	529 ICI 321.7 – 869.9 CR 0.90	278 ICI 84.4 – 916.2 CR 0.47	2516 ICI 1843.2 – 3434.4 CR 0.47	521 ICI 240.3-1129.6 CR 0.88	The higher incidence is Oesophagus

ICI = Incidence Confidence Interval CR =Crude Ratio

3.1. Level of evidence

This study applied level of evidence based on the framework provided by NHMRC (Health, 2009) considered to grade the studies based on the quality of the methodology used (design, validity, and applicability). The level of evidence of the selected studies was low level III-3 (Table 2).

3.2. Critical appraisal of identified studies

The characteristics of the participants were included for critical appraisal in Tables 1 and 2. A descriptive data was developed in Table 1. The four articles assessed have different approaches about LOCP regarding. data sources were from different sources: from medical records (Campbell *et al.*, 2016; Poudel, Huang and Neupane, 2016; Shaikh *et al.*, 2017), pathology laboratory registers (Shaikh *et al.*, 2017) and from National survey such as (Lorenzoni *et al.*, 2018) (Table 2).

To obtain a broader knowledge about the about LOCP for these countries, we extracted data from the GLOBOCAN 2018 database regarding prevalence (Table 3) and incidence (Table 4) for forty-seven least developed countries. Although Tables 3 and 4 only show data for the four countries assessed in the other papers, total data of the forty-seven countries can be found in Table A2 and Table A2 of the Appendix.

Study characteristics

The four studies analysed, four level III-3 were focused on specific low-income countries: Tanzania, Mozambique, Bangladesh, Nepal (Campbell *et al.*, 2016; Poudel, Huang and Neupane, 2016; Shaikh *et al.*, 2017; Lorenzoni *et al.*, 2018). These four studies were based on local databases. Three studies obtained their data from hospital records (Campbell *et al.*, 2016; Poudel, Huang and Neupane, 2016; Shaikh *et al.*, 2017), and another one (Lorenzoni *et al.*, 2018) was from records by two local surveys on the same city in two different time periods based in hospital records and pathology laboratory records. All the analysed studies were retrospective.

Participant characteristics

All the studies analysed showed different level of heterogeneity in the presentation of their data about their participants were concerned (Table 2). Campbell et al. (2016), describes the participants by gender. It mentions the group of women only in one period of the study (2010 -

2014), but it does not carry out a comparative study of the impact of cancer by gender either age in all period of the time (2002-2014), Campbell et al., did not include data from 2007 because records from that year were not available. Lorenzoni et al. (2018) compares the incidence in two periods of the time: 1956 - 1961 and 1991 - 2008. They analysed an increase from 169.9 cases per 100 000 in 1956 - 1961 to 182.7 in 1991- 2008 in men and from 95.3 to 186.0 cases per 100 000 in women. (Shaikh *et al.*, 2017) conducted a comparative study of types of LOCP cancer by gender, and Poudel and colleagues (Poudel, Huang and Neupane, 2016) describes the participants by age group in detail, but does not carry out oral and pharyngeal type of cancers and only mentioned larynx cancer.

Table 2 shows that a higher proportion of male cases in Bangladesh was due to Human Papillomavirus (HPV) (21.7% male vs. 16.6% for women) but not significantly different by sex (Shaikh *et al.*, 2017). Poudel et al. (2016) revealed that larynx was the third most common cancer incidence) for male in Nepal.

Global cancer burden: incidence and prevalence

GLOBOCAN studies carried out by the International Agency for Research on Cancer (IARC) (Ferlay *et al.*, 2010; Shield *et al.*, 2017; Bray, Ferlay and Soerjomataram, 2018)(Franceschi and Wild, 2013). It also provides the latest estimates on the number, and of the global deaths rates from cancer (Wang *et al.*, 2019). A description of the methods used to produce these estimates is provided in GLOBOCAN. Data are also discussed and presented according to the Human Development Index (HDI) groups (Ferlay *et al.*, 2015).

Table 3 and Table A2 (Appendix) analysed GLOBOCAN 2018 database the higher prevalence in low income countries in the period 2014-2018. Tanzania registered 29761 proportion per 100 000 of prevalence about Lip and oral cavity cancers (C00-06), Democratic Republic of Congo registered 1657 per 100 000 of prevalence about salivary glands (C07-08). Yemen indicated the higher prevalence of 7284 per 100 000 about Oesophagus (C15) and Laos registered 526 per 100 000 about Nasopharynx (C11) Cancer.

Table 4 depicts registers of the incidence in less developed countries. Afghanistan reported a higher incidence of Lip and oral cavity cancers (C00-06) with 1377 cases per 100 000 Bangladesh reported the incidence of 20906 per 100 000 on Oesophagus cancer (C15).

4. Discussion

This systematic review found four studies included after searching in four electronic databases. The articles selected depict LOCP cancer prevalence and/or incidence numbers published in the last 5 years, in Tanzania, Mozambique, Bangladesh and Nepal. As well, data from the Global Cancer Observatory GLOBOCAN on four (Table 3 and 4) out of the forty-seven low income countries (Tables A2 and A3, Appendix) for 2018 were included. The four papers also shed some understanding on how the low-income countries address cancer and specifically the lip, oral cavity, the oropharynx, and the larynx cancer.

Gender differences in LOCP

The four studies mentioned show higher values of incidence of LOCP cancer in male in comparation to female. The head and neck cancers percent diagnosed in Tanzania during 2010-2014, were almost twice as high in men as in women, included in that LOCP cases (Campbell *et al.*, 2016) (Table 2). In Mozambique incidence of LOCP in men increase while the opposite (decrease) occurs in women 1956 and 1961. Lorenzoni et al (2018) registered in his study between 2003 and 2008, a total of 600 cases (403 in men, 197 in women) of 18 types of cancer included in that LOCPs.

The age standardized rate (ASR) of ten major cancer sites per 100 000 in males in Nepal, registered for Larynx were 1.69 and 1.21 per another parts of mouth, and the female ten major cancer in Nepal does not consider larynx in either parts of mouth cancer (Poudel, Huang and Neupane, 2016).

Age differences in LOCP

Patients with cancer of head and neck had the oldest mean age at diagnosis (59.3 ±13.4 years) in comparison another type of cancer in Tanzania (Campbell *et al.*, 2016). Mozambique increased age standardised rate from 3.8 to 5.0 in male per 100 000 between 1956 and 1961. And decreasing in female from 4.8 to 4.5 value in age standardised rate per 100 000 (Lorenzoni *et al.*, 2018).

The changes in the cancer profile should be expected in LOCP in the upcoming years in Mozambique, due to the constant growth of population, the higher life expectancy, and the increased prevalence of economic transition-associated risk factors (Lorenzoni *et al.*, 2018). Shaikh et al. (2017) mentioned in his study a mean age of all patients was 56.6 years, cancers

in oral cavity 55 (31.6%), oropharynx 35 (20.1%), larynx 64 (36.8%) and hypopharynx 20 (11.5%).

Behaviour habits: Smoke and alcohol consumption

The papers included in this study show that the behavioural habits such as smoke and alcohol consumption increased in less developed countries in opposite to the developed countries (Sheiham, 2005; Ariyawardana and Johnson, 2013; Bray *et al.*, 2015)**.**

Patients who presented head and neck cancers had previously smoked (40.4% and 54,5% respectively) and previously consumed alcohol (42,2% and 48,2% respectively) (Campbell *et al.*, 2016) .Mozambique presented an increasing incidence of cancers related to lifestyle risk factors (Lorenzoni *et al.*, 2018).

While an increasing trend of Human Papillomavirus (HPV) - associated with oropharyngeal cancer - is seen in developed countries, where tobacco and alcohol related LOPCs cases are decreasing, in the other parts of the world such as in South East Asia or East Asia this trend is not yet clear, because there are lack of data from these regions. Such studies have been published have small sample sizes and have examined mostly cancers of the oral cavity stating as possibly cause the tobacco and alcohol consumption (Shaikh *et al.*, 2017). Nepal increasing his incidence in head and neck malignancy, and their incidence increasing such as the other developing countries probably due to increased use of alcohol and smoking (Poudel, Huang and Neupane, 2016).

Comorbidity

The less developed countries focused their studies in other pathologies such as AIDS, HPV and Hepatitis, and as the secondary role in their studies (Mbulaiteye *et al.*, 2011). The relationship of Human Papillomavirus (HPV) and head and neck squamous cell carcinoma (HNSCC) was extensively supported by literature (Saussez *et al.*, 2010; Gupta, Ariyawardana and Johnson, 2013; Auluck *et al.*, 2014; Petito *et al.*, 2016).

Even if LOCP remain a significant cause of morbidity worldwide with approximately 650 000 new cases diagnosed each year (Saussez *et al.*, 2010)(Abudu *et al.*, 2019) the number of diagnoses cases of LOCP increased in low income countries (Barnes *et al.*, 2005; Zini *et al.*, 2009). Most registries with the highest incidence rates of LOCP occur for males and were located in Asia, Micronesia and South Africa. In contrast, the lowest rates were observed from registries

in Central America, Melanesia, Western Europe, South America and North Europe (Sun *et al.*, 2011).

A further evidence for increasing trends in non-AIDS-defining cancer frequency burden head and neck cancers included in that Lip and oral and pharyngeal cancers (Campbell *et al.*, 2016). Mozambique presents, as many other Low income and middle income countries do, a dual burden with a still high incidence of cancers associated with infectious diseases (Lorenzoni *et al.*, 2018).

Studies in Epidemiology, clinical, and molecular area, mentioned that high-risk HPV plays an essential role in the aetiopathogenesis of some LOCP due to HPV are mostly seen in the oropharyngeal region due to the presence of lymphoid tissue, which makes it vulnerable to HPV infection (Shaikh *et al.*, 2017).

Educational level and other socio-economic factors

An educational level and health care access and the introduction of new diagnostic techniques may have played a role in increased cancer detection Mozambique National Surveys (Lorenzoni *et al.*, 2018).

National Cancer registry

One limitation about understanding cancer burden was an the inexistence of currently have a population based cancer registry such as Tanzania (Campbell *et al.*, 2016)**.**

Shaikh et al, (2017) presented in his study the first comprehensive study from Bangladesh and one of the first studies from South Asia to use a combination of detection methods for HPV and their interrelationship with cell cycle markers of putative prognostic value the largest public laboratory in the nation and receives a wide range of patients and tissue samples from all corners of Bangladesh.

The infrastructure of health facilities was extremely poor in Nepal though the government had announced that health care to be a fundamental right for everyone. The government in Nepal had given the lowest priority for the management of cancer (Poudel, Huang and Neupane, 2016).

In the absence of the implementation of prevention of early screening of LOCP programs do not have the resources to diagnose and treat all new cancer patients, and the economic burden becomes unsustainable. Such a scenario amplifies socio-economic differentials (Rafiemanesh *et al.*, 2015), making effective therapies a preserve of the richest in most societies. There are

many examples of a complete lack of essential infrastructure to presently tackle cancer (Bray *et al.*, 2015).

5. Conclusion

In conclusion, the LOCP in less developed countries was substantial, particularly for men and residents in Tanzania, Mozambique, Bangladesh, and Nepal. The age range more affected was over 56 years. Smoke and alcohol consumption that a more probably reason for increased values.

Less developed countries were not a specific program to early detection tumour. All the registered were obtained from diagnosticated patient. the studies found were based in Data collected from medical records (clinical and histological studies) and national surveys. Most less developed countries are still focusing only on transmissible diseases and forgotten a non-communicable disease such as Oral and pharyngeal cancers and other cancers.

Educational level and other socio-economic factors should be considered to implemented in low income countries a sustainable cancer prevention program. It is a priority the engagement of stakeholders at country level would facilitate the design of more specific and comprehensive strategies based on local needs.

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Appendix 1

Table A1 - PRISMA Checklist.

Section/ topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	

Table A1 – cont.

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data) role of funders for the systematic review.	

Table A2 –GLOBOCAN 2018 REGISTERS PREVALENCE - Estimated number of prevalent cases in 2018 - Complete description of data reported for Less developed countries (Table 3 of the thesis mentions 4 of the countries here included).

Country	Gender	Lip and oral cavity cancers (C00-06)	Salivary glands (C07-08)	Oropharynx cancer (C09-10)	Nasopharynx (C11)	Hipopharynx cancer (C12-13)	Oesophagus (C15)	Larynx (C32)	Main findings
Afghanistan	M/F	2 343 P 6.4	104 P 0.29	200 P 0.55	169 P 0.46	209 P 0.57	1 251 P 3.4	539 P 1.5	The higher prevalence is Lip and Oral cavity cancers
Angola	M/F	676 P 2.2	177 P 0.58	151 P 0.49	177 P 0.58	18 P. 0.06	321 P 1.0	369 P 1.2	The higher prevalence is Lip and Oral cavity cancers
Bangladesh	M/F	27 631 P 16.6	1 587 P 0.95	8563 P 5.1	1 951 P 1.2	8 504 P 5.1	19 662 P 11.8	10 185 P 6.1.	The higher prevalence is Lip and Oral cavity cancers
Benin	M/F	138 P 1.2	76 P 0.66	32 P 0.28	92 P 0.80	11 P 0.10	315 P 2.7	73 P 0.64	The higher prevalence is Lip and Oral cavity cancers
Bhutan	M/F	45 P 5.5	4 P 0.49	10 P 1.2	42 P 5.1	16 P 2.0	42 P 5.1	24 P 2.9	The higher prevalence is Lip and Oral cavity cancers
Burkina Faso	M/F	245 P 1.2	64 P 0.32	53 P 0.27	13 P 0.07	7 P 0.04	110 P 0.56	102 P 0.52	The higher prevalence is Lip and Oral cavity cancers
Burundi,	M/F	210 P 1.9	37 P 0.33	49 P 0.44	180 P 1.6	30 P 0.27	485 P 4.3	114 P 1.0	The higher prevalence is Oesophagus
Cambodia	M/F	861 P 5.3	142 P 0.87	211 P 1.3	569 P 3.5	86 P 0.53	271 P 1.7	260 P 1.6	The higher prevalence is Lip and Oral cavity cancers
Central African Republic,	M/F	39 P 0.82	19 P 0.40	16 P 0.34	60 P 1.3	8 P 0.17	56 P 1.2	13 P 0.27	The higher prevalence is Oesophagus
Chad	M/F	144 P 0.94	75 P 0.49	55 P 0.36	191 P 1.2	32 P 0.21	119 P 0.78	64 P 0.42	The higher prevalence is Nasopharynx
Comoros	M/F	26 P 3.1	No data	No data	4 P 0.48	1 P 0.12	35 P 4.2	10 P 1.2	The higher prevalence is Oesophagus
Democratic Republic of the Congo	M/F	1 173 P 1.4	1 657 P 2.0	64 P 0.08	418 P 0,50	58 P 0.07	763 P 0.91	568 P 0.68	The higher prevalence is Salivary glands
Djbouti	M/F	23 P 2.4	No data	No data	9 P 0.93	No data	26 P 2.7	7 P 0.72	The higher prevalence is Oesophagus
Eritrea	M/F	72 P 1.4	14 P 0.27	6 P 0.12	76 P 1.5	5 P 0.10	104 P 2.0	22 P 0.42	The higher prevalence is Oesophagus
Ethiopia	M/F	1 215 P 1.1.	401 P 0.37	162 P 0.15	1 242 P 1.2	No data	1 716 P 1.6	257 P 0.24	The higher prevalence is Oesophagus
Gambia	M/F	No data	No data	No data	No data	No data	6 P 0.28	2 P 0.09	The higher prevalence is Oesophagus
Guinea	M/F	171 P 1.3	30 P 0.23	34 P 0.26	6 P 0.05	2 P 0.02	25 P 0.19	93 P 0.71	The higher prevalence is Lip and Oral cavity cancers

Country	Gender	Lip and oral cavity cancers (C00-06)	Salivary glands (C07-08)	Oropharynx cancer (C09-10)	Nasopharynx (C11)	Hipopharynx cancer (C12-13)	Oesophagus (C15)	Larynx (C32)	Main findings
Guinea-Bissau	M/F	24 P 1.3	No data	No data	No data	No data	20 P 1.0	9 P 0.47	The higher prevalence is Lip and Oral cavity cancers
Haiti	M/F	311 P 2.8	223 P 2.0	386 P 3.5	134 P 1.2	59 P 0.53	179 P 1.6	134 P 1.2	The higher prevalence is Lip and Oral cavity cancers
Kiribati	M/F	No data	No data	No data	No data	No data	No data	No data	No data available
Lao People's Democratic Republic	M/F	360 P 5.2	76 P 1.1	69 P 0.99	526 P 7,6	55 P 0.79	196 P 2.8	128 P 1.8	The higher prevalence is Nasopharynx Nasopharynx
Lesotho	M/F	68 P 3.0	13 P 0.57	4 P 0.18	4 P 0.18	7 0.31	61 P 2.7	31 P 1.4	The higher prevalence is Lip and Oral cavity cancers
Liberia	M/F	55 P 1.1	12 P 0.25	7 P 0.14	5 P 0.10	1 P 0.02	13 P 0.27	33 P 0.68	The higher prevalence is Lip and Oral cavity cancers
Madagascar	M/F	744 P 2.8	252 P 0.96	192 P 0.73	330 P 1.3	69 P 0.26	1 008 P 3.8	421 P 1.6	The higher prevalence is Oesophagus
Malawi	M/F	330 P 1.7	170 P 0.89	9 P 0.05	119 P 0.62	No data	1 754 P 9.2	85 P 0.44	The higher prevalence is Oesophagus
Mali	M/F	283 P 1.5	99 P 0.52	56 P 0.29	29 N 0.15	11 P 0.06	180 P 0.94	106 P 0.55	The higher prevalence is Lip and Oral cavity cancers
Mauritania	M/F	69 P 1.5	17 P 0.37	4 P 0.09	14 P 0.31	1 P 0.02	31 P 0.68	38 P 0.84	The higher prevalence is Lip and Oral cavity cancers
Mozambique	M/F	28 004 P 2.1	9.522 P.0.72	5 878 P 0.45	22.820 P 1.7	2 445 P 0.19	27.658 P 2.1	21 714 P 1.6	The higher prevalence is Lip and Oral cavity cancers
Myanmar,	M/F	4.682 P 8.7	428 P 0.79	1 396 P 2.6	4 624 P 8.6	1 402 P 2.6	3 327 P 6.2	2 409 P 4,5	The higher prevalence is Lip and Oral cavity cancers
Nepal	M/F	2 438 P.8.2	292 P. 0.99	535 P1.8	502 P 1.7	312 P.1.1	526 P.1.8	1 228 P 4.1	The higher prevalence is Lip and Oral cavity cancers
Niger,	M/F	171 P 0.77	79 P 0.35	53 P 0.24	70 P 0.31	17 P 0.08	121 P 0.54	80 P 0.36	The higher prevalence is Lip and Oral cavity cancers
Rwanda	M/F	423 P 3.4	544 P 4.4	18 P 0.14	134 P 1.1	23 P 0.18	209 P 1.7	136 P 1.1	The higher prevalence is Lip and Oral cavity cancers
Sao Tome and Principe	M/F	No data	No data	No data	No data	No data	1 P 0.48	2 P 0.96	The higher prevalence is Larynx
Senegal	M/F	243 P 1.5	82 P 0.50	60 P 0.37	58 P 0.36	4 P 0.02	102 P 0.63	122 P 0.63	The higher prevalence is Lip and Oral cavity cancers
Sierra Leone	M/F	88 P 1.1	27 0.35	8 P 0.10	31 P 0.40	2 P 0.03	38 P 0.49	46 P 0.60	The higher prevalence is Lip and Oral cavity cancers
Solomon Islands	M/F	17 P 2.7	4 P 0.64	Non data	Non data	Non data	1 P 0.64	8 P 1.3	The higher prevalence is Lip and Oral cavity cancers

Country	Gender	Lip and oral cavity cancers (C00-06)	Salivary glands (C07-08)	Oropharynx cancer (C09-10)	Nasopharynx (C11)	Hipopharynx cancer (C12-13)	Oesophagus (C15)	Larynx (C32)	Main findings
Somalia	M/F	189 P 1.2	36 P 0.24	20 P 0.13	228 P 1.5	8 P 0.05	507 P 3.3	63 P 0.41	The higher prevalence is Oesophagus
South Sudan	M/F	219 P 1.7	42 P 0.33	28 P 0.22	234 P 1.8	15 P 0.12	496 P 3.8	100 P 0.77	The higher prevalence is Oesophagus
Sudan	M/F	917 P 2.2	169 P 0.41	97 P 0.23	976 P 2.4	128 P 0.31	1 062 P 2.6	419 P 1.0	The higher prevalence is Oesophagus
Timor-Leste	M/F	14 P 1.1	No data	No data	114 P 8.6	No data	4 P 0.30	9 P 0.68	The higher prevalence is Nasopharynx
Togo	M/F	99 P 1.2	92 P 1.2	68 P 0.85	34 P 0.43	2 P 0.03	98 P 1.2	103 P 1.3	The higher prevalence is Larynx
Tuvalu	M/F	No data	No data	No data	No data	No data	No data	No data	Non data available
Uganda	M/F	508 P 1.1.	187 P 0.42	199 P 0.45	721 P 1.6	48 P 0.11	1 631 P 3.7	324 P 0.73	The higher prevalence is Oesophagus
United Republic of Tanzania	M/F	29 761 P2.2	9466 P. 0.70	5.936 P0.44	23 945 P.1.8	2 747 P. 0.20	28 976 P2.2	22 363 P. 1.7	The higher prevalence is Lip and Oral cavity cancers
Vanuatu	M/F	10 P 3.5	2 P 0.71	No data	No data	No data	No data	5 P 1.8	The higher prevalence is Lip and Oral cavity cancers
Yemen	M/F	399 P 1.4	219 P 0.76	92 P 0.32	659 P 2.3	12 P 0.04	7284 P	404 P 1.4	The higher prevalence is Oesophagus
Zambia	M/F	207 P 1.2	98 P 0.56	32 P 0.18	149 P 0.85	15 P 0.09	364 P 2.1	129 P 0.73	The higher prevalence is Oesophagus

UI= Uncertainty Interval / CR= Crude Ratio/ASR World / P= Proportion per 100 000

Table A3**. GLOBOCAN 2018 REGISTERS INCIDENCE** Crude and age-standardized rates per 100 000 **Complete description of data reported for Less developed countries** (**Table 4 of the thesis mentions 4 of the countries here included).**

Country	**Gender**	**Lip and oral cavity cancers (C00-06)**	**Salivary glands (C07-08)**	**Oropharynx cancer (C09-10)**	**Nasopharynx (C11)**	**Hipopharynx cancer (C12-13)**	**Oesophagus (C15)**	**Larynx (C32)**	**Main findings**
Afghanistan	M/F	1 377 ICI 1154.3-1771.5 CR 3.9	69 ICI 18.7-255.3 CR 0.19	105 ICI 47.2 – 233.4 CR 0.29	82 ICI 33.6 – 200.1 CR 0.23	205 ICI 82.0-512.6 CR 0.56	1312 ICI 977.6 – 1760.8 CR 3.6	319 ICI 168.5 – 604.0 CR 0.88	The higher incidence is Lip and Oral cavity cancers
Angola	M/F	353 ICI 196.8 – 633.1 CR 1.1	104 ICI 54.0-200.3 CR 0.34	70 ICI 24.5 – 200.3 CR 0.23	77 ICI 40.0-148.3 CR 0.25	16 ICI 6.7 – 38.0 CR 0.05	337 ICI 175.1-648.5 ICR 1.1	193 ICI 83.4-446.4 CR 0.63	The higher incidence is Lip and Oral cavity cancers
Bangladesh	M/F	13,401 ICI 8,515.7-21,088.8 CR 8.1	849 ICI 229.5-3140.9 CR 0.51	3667 ICI 1649.6-8151.7 CR 2.2	845 ICI 346.4-2061.5 CR 0.51	7099 ICI 2839.0-17,751.0 CR 4.3	20 906 ICI 15 577.4-28057.3 CR 12.6	4996 ICI 2638.7 – 9459.3 CR 3.0	The higher incidence is Oesophagus
Benin	M/F	80 ICI 48.1-133.2 CR 0.70	47 ICI 28.9-76.4 CR 0.41	16 ICI 7.1 – 36.2 CR 0.14	44 ICI 23.0-84.1 CR 0.38	10 ICI 3.1 – 32.2 CR 0.09	338 ICI 205.5 – 555.9 CR 2.9	41 ICI 18.8 – 89.3 CR 0.36	The higher incidence is Oesophagus
Bhutan	M/F	21 ICI 18.9 - 23.3 CR 2.6	2 ICI 1.4-2.9 CR 0.24	4 ICI 3.4-4.7 CR 0.49	16 ICI 12.9 - 19.9 CR 2.0	14 ICI 12.4-15.8] CR 1.7	44 ICI 40.8 – 47.5 CR 5.4	11 ICI 9.3 – 13.0 CR 1.3	The higher incidence is Oesophagus
Burkina Faso	M/F	182 ICI No data CR 0.88	51 ICI No data CR 0.25	36 ICI No data CR 0.18	26 ICI No data CR 0.13	22 ICI No data CR 0.11	161 ICI No data CR 161	82 ICI No data CR 0.40	The higher incidence is Oesophagus
Burundi	M/F	142 ICI 62.4-323.2 CR 1.3	31 ICI 14.6 – 65.7 CR 0.28	29 ICI 7.8-107.3 CR 0.26	104 ICI 44.2-244.9 CR 0.26	35 ICI 13.1- 93.6 CR 0.31	520 ICI 297.8-907.9 CR 4.6	78 ICI 29.7 – 204.6 CR 0.70	The higher incidence is Oesophagus
Cambodia	M/F	424	74	99	256	74	288	127	The higher incidence is Lip and Oral cavity cancers

Country	Gender	Lip and oral cavity cancers (C00-06)	Salivary glands (C07-08)	Oropharynx cancer (C09-10)	Nasopharynx (C11)	Hipopharynx cancer (C12-13)	Oesophagus (C15)	Larynx (C32)	Main findings
		ICI 208.5-862.4 CR 2.6	ICI 36.4 – 150.5 CR 0.46	ICI 53.8 – 182.1 CR 0.61	ICI 134.9-485.9 CR 1.6	ICI 44.7-122.6 CR 0.46	ICI 155.7 – 532.6 CR 1.8	ICI59.5-271.1 CR 0.78	
Central African Republic	M/F	33 ICI 18.4 - 59.2 CR 0.70	18 ICI 9.3-34.7 CR 0.38	11 ICI 3.8 – 31.5 CR 0.23	42 ICI 21.8-80.9 CR 0.89	11 ICI 4.6-26.1 CR 0.23	58 ICI 30. 1 – 111.6 CR 1.2	11 ICI 4.8 – 25.4 CR 0.23	The higher incidence is Oesophagus
Chad	M/F	103 ICI 57.4-184.7 CR 0.67	53 ICI 27.5 – 102.1 CR 0.35	34 ICI 11.9-97.3 CR 0.22	111 ICI 57.6-213.8 CR 0.72	35 ICI 14.7 – 83.1 CR 0.23	128 ICI 66.5 – 246.3 CR 0.83	45 ICI 19.5 – 104.1 CR 0.29	The higher incidence is Oesophagus
Comoros	M/F	13 ICI 5.7 – 29.6 CR 1.6	No data	No data	2 ICI 0.80 - 4.7 CR 0.24	1 ICI 0.40 – 2.7 CR 0.12	35 ICI 20.0 - 61.1 CR 4.2	5 ICI 1.9-13.1 CR 0.60	The higher incidence is Oesophagus
Democratic Republic of the Congo	M/F	731 ICI 407.6 – 1311.1 CR 0.87	640 ICI 332.3-1232.8 CR 0.76	37 ICI 12.9-105.9 CR 0.04	215 ICI 111.6 – 414.1 CR 0.26	57 ICI 24.0-135.4 CR 0.07	805 ICI 418.3 – 1549.0 CR 0.96	367 ICI 158.7 – 848.9 CR 0.44	The higher incidence is Oesophagus
Dji-bouti	M/F	12 ICI 5.3 – 27.3 CR 1.2	No data	No data	5 ICI 2.1-11.8 CR 0.51	No data	25 ICI 14.3-43.7 CR 2.6	4 ICI 1.5 – 10.5 CR 0.41	The higher incidence is Oesophagus
Eritrea	M/F	46 ICI 20.2-104.7 CR 0.89	12 ICI 5.7 – 25.4 CR 0.23	4 ICI 1.1-14.8 CR 0.08	42 ICI 17.8-98.9 CR 0.81	5 ICI 1.9 – 13.4 CR 0.10	108 ICI 61.9-188.6 CR 2.1	15 ICI 5.7 - 39.4 CR 0.29	The higher incidence is Oesophagus
Ethiopia	M/F	744 ICI 419.7 – 1318.9 CR 0.69	280 ICI 161.7-484.7 CR 0.26	87 ICI 30.3 – 250.0 CR 0.08	608 ICI 375.5-984.4 CR 0.57	No data	1 752 ICI 1166.4-2631.6 CR 1.6	156 ICI 73.9-329.1 CR 0.15	The higher incidence is Oesophagus
Gambia	M/F	Non data	No data	No data	No data	No data	6 ICI 4.1 – 8.9 CR 0.28	1 ICI 0.50 – 1.9 CR 0.05	The higher incidence is Oesophagus

Country	Gender	Lip and oral cavity cancers (C00-06)	Salivary glands (C07-08)	Oropharynx cancer (C09-10)	Nasopharynx (C11)	Hipopharynx cancer (C12-13)	Oesophagus (C15)	Larynx (C32)	Main findings
Guinea	M/F	109 ICI 43.1-275.5 CR 0.84	24 ICI 13.0-44.1 CR 0.18	20 ICI 10.1-39.4 CR 0.15	4 ICI 0.90-17.2 CR 0.03	2 ICI 0.60 – 7.0 CR 0.02	27 ICI 14.4 – 50.8 CR 0.21	64 ICI 32.2-127.2 CR 0.49	The higher incidence is Lip and Oral cavity cancers
Guinea-Bissau	M/F	14 ICI II4.5-43.2 CR 0.73	No data	No data	No data	No data	20 ICI 3.3 – 121.7 CR 1.0	5 ICI 1.0-24.1 CR 0.26	The higher incidence is Oesophagus
Haiti	M/F	177 ICI 142.6 – 219.7 CR 1.6	154 ICI 125.2-189.4 CR 1.4	210 ICI 138.4-318.7 CR 1.9	64 ICI 22.5-182.0 CR 0.58	59 ICI 47.3 -73.6 CR 0.53	191 ICI 32.8-274.7 CR 1.7	70 ICI 60.2-81.5 CR 0.63	The higher incidence is Oesophagus
Kiribati	M/F	No data	No data	No data	No data	No data	No data	No data	Non data available.
Lao People's Democratic Republic	M/F	168 ICI 82.6 – 341.7 CR 2.4	34 ICI 16.7 – 69.2 CR 0.49	31 ICI 16.9-57.0 CR 0.45	226 ICI 119.1 – 429.0 CR 3.2	46 ICI 27.8-76.2 CR 0.66	207 ICI 111.9-382.8 CR 3.0	63 ICI 29.5-134.5 CR 0.91	The higher incidence is Oesophagus
Lesotho	M/F	37 ICI 15.7-87.4 CR 1.6	6 ICI 1.8 – 20.2 CR 0.27	2 ICI0.90-4.2 CR 0.09	2 ICI 1.1 – 3.8 CR 0.09	7 ICI 3.6-13.8]CR 0.31	69 ICI 32.6 – 145.8 CR 3.0	17 ICI 7.0-41.1 CR 0.75	The higher incidence is Oesophagus
Liberia	M/F	34 ICI 11.0 – 104.8 CR 0.70	12 ICI 4.6 – 31.6 CR 0.25	4 ICI 1.4 – 11.4 CR 0.08	3 ICI 0.70-12.1 CR 0.06	1 ICI 0.30-4.0 CR 0.02	13 ICI 2.1-79.1 CR 0.27	20 ICI 4.2 – 96.3 CR 0.41	The higher incidence is Lip and Oral cavity cancers
Madagascar	M/F	394 ICI 173.1-896.6 CR 1.5	148 ICI 69.8 – 313.6 CR 0.56	86 ICI 23.3-318.1 CR 0.33	149 ICI 63.3-350.8 CR 0.57	67 ICI 25.1-179.1 CR 0.26	1085 CI 621.4 – 1894.4 CR 4.1	232 CI 88.4 – 608.6 CR 0.88	The higher incidence is Oesophagus
Malawi	M/F	193 ICI 92.2 – 404.1 CR 1.0	10 ICI 67.4 – 170.0 CR 0.56	5 ICI 0.90 – 26.5 CR 0.03	49 ICI 25.5-94. CR 0.26	No data	1 844 ICI 1437.9-2364.8 CR 9.6	55 ICI 29.3 – 103.3 CR 0.29	The higher incidence is Oesophagus

Country	Gender	Lip and oral cavity cancers (C00-06)	Salivary glands (C07-08)	Oropharynx cancer (C09-10)	Nasopharynx (C11)	Hipopharynx cancer (C12-13)	Oesophagus (C15)	Larynx (C32)	Main findings
Mali	M/F	173 ICI 109.9 – 272.3 CR 0.91	63 ICI 39.9-99.4 CR 0.33	32 ICI 19.6 – 52.3 CR 0.17	18 ICI 9.97 – 33.3 CR 0.09	12 ICI 5.7-25.1 CR 0.06	190 ICI 125.7-287.3 CR 0.99	68 ICI 40.2 -114.9 CR 0.36	The higher incidence is Oesophagus
Mauritania	M/F	36 ICI 11.7 – 111.0 CR 0.79	9 ICI 3.4 – 23.7 CR 0.20	2 ICI 0.70-5.7 CP 0.04	7 ICI 1.7-28.1 CP 0.15	1 ICI 0.30-4.0 CP 0.02	31 ICI 5.1-188.6 CP 0.68	20 ICI 4.2 -96.3 CR 0.44	The higher incidence is Lip and Oral cavity cancers
Mozambique	M/F	297 ICI 180.5-488.6 CR 0.97	240 ICI 145.9 – 394.9 CR 0.79	114 ICI 54.5-238.6 CR 0.37	41 ICI I7.9-213.8 CR 0.13	No data	1 056 ICI 822.1-1356.4 CR 3.5	224 ICI 131.1-382.8 CR 0.73	The higher incidence is Oesophagus
Myanmar	M/F	2371 ICI 1165.7 – 4822.5 CR 4.4	236 ICI 116.0-480.0 CR 0.44	632 ICI 343.6 – 1162.3 CR 1.2	2 084 ICI 1098.0-3955.6 CR 3.9	1 233 ICI 744.0-2043.4 CR 2.3	3 483 ICI 1883.3-6441.4 CR 6.5	1237 ICI 579.5 – 2640.6 CR 2.3	The higher incidence is Oesophagus
Nepal	M/F	1,207 ICI 786.1-1853.3 CR 4.1	160 ICI 78.4-326.6 CR 0.54	246 ICI 142.1-425.8 CR 0.83	222 ICI 139.5-353.3 CR 0.75	281 ICI 135.1-584.6 CR 0.95	565 ICI 395.9-806.3 CR 1.9	572 ICI 348.6 – 938.5 CR 1.9	The higher incidence is Lip and Oral cavity cancers
Niger	M/F	134 ICI 81.8 -219.4 CR 0.60	62 ICI 30.4 – 126.3 CR 0.28	39 ICI 15.4 – 99.0 CR 0.17	35 ICI 13.8-88.9 CR 0.16	15 ICI 3.6 – 62.3 CR 0.07	137 ICI 72.5-258.9 CR 0.61	65 ICI 33.6-125.6 CR 0.29	The higher incidence is Oesophagus
Rwanda	M/F	222 ICI 146.4 – 336.7 CR 1.8	178 ICI 94.2-336.3 CR 1.4	9 ICI 2.6 -30.8 CR 0.07	53 ICI 17.6-159.5 CR 0.42	20 ICI 7.9 – 50.7 CR 0.16	218 ICI 26.2-376.5 CR 1.7	75 ICI 34.4-163.5 CR 0.60	The higher incidence is Lip and Oral cavity cancers
Sao Tome and Principe	M/F	No data	No data	No data	No data	No data	1 ICI 0.20 – 5.0 CR 0.48	1 ICI 0.90 -1.1 CR 0.48	The similar incidence between Oesophagus and Larynx
Senegal,	M/F	130 ICI 42.2- 400.9 CR 0.80	51 ICI 19.4 – 134.3 CR 0.31	30 ICI 10.5-85.8 CR 0.18	31 ICI 7.7 – 124.5 CR 0.19	4 ICI 1.0 -15.9 CR 0.02	108 ICI 17.7 – 657.2 CR 0.66	66 ICI 13.7-317.6 CR 0.41	The higher incidence is Lip and Oral cavity cancers

Country	Gender	Lip and oral cavity cancers (C00-06)	Salivary glands (C07-08)	Oropharynx cancer (C09-10)	Nasopharynx (C11)	Hipopharynx cancer (C12-13)	Oesophagus (C15)	Larynx (C32)	Main findings
Sierra Leone	M/F	54 ICI 40.5 – 72.1 CR 0.70	18 ICI 11.2 -28.9 CR 0.23	4 ICI 2.5-6.3 CR 0.05	16 ICI 10.5-24.3 CR0.21	2 ICI 1.1-3.5 CR0.03	38 ICI 27.5-52.4 CR0.49	29 ICI 19.8-42.5 CR 0.38	The higher incidence is Lip and Oral cavity cancers
Solomon Islands	M/F	9 ICI 7.4- 10.9 CR 1.4	2 ICI 1.2-3.3 CR 0.32	No data	No data	No data	1 ICI 0.80-1.2 CR 0.16	4 ICI 2.9 – 5.5. CR 0.64	The higher incidence is Lip and Oral cavity cancers
Somalia	M/F	153 ICI 67.2 – 348.2 CR 1.0	34 ICI 16.0-72.0 CR 0.22	14 ICI 3.8 – 51.8 CR 0.09	149 ICI 63.3-350.8 CR 0.98	7 ICI 2.6-18.7 CR 0.05	524 ICI 300.1-914.9 CR 3.5	51 ICI 19.4 – 133.8 CR 0.34	The higher incidence is Oesophagus
South Sudan,	M/F	14 ICI 61.5-318.6 CR 1.1	33 ICI 15.6 – 69.9 CR 0.26	17 ICI 4.6 – 62.9 CR 0.13	133 ICI 56.5 – 313.1 CR 1.0	16 ICI 6.0-42.8 CR 0.12	523 ICI 299.5 - 913.2 CR 4.0	66 ICI 25.2-173.1 CR 0.51	The higher incidence is Oesophagus
Sudan	M/F	51 ICI 310.9 – 849.8 CR 1.2	99 ICI 47.1 – 208.1 CR 0.24	48 ICI 16.0-144.4 CR 0.12	465 ICI 291. 1 – 742.7 CR 1.1	114 ICI 69.0 – 188.5 CR 0.27	1 132 ICI 799.0-1603.7 CR 2.7	238 ICI 121.2 – 467.2 CR 0.57	The higher incidence is Oesophagus
Tanzania	M/F	1098 ICI 686.2 – 1756.9 CR 1.9	178 ICI 98.1-323.1 CR 0.30	115 ICI 46.7 – 283.3 CR 0.19	529 ICI 321.7 - 869.9 CR 0.90	278 ICI 84.4 – 916.2 CR 0.47	2516 ICI 1843.2 – 3434.4 CR 4.3	521 ICI 240.3-1129.6 CR 0.88	The higher incidence is Oesophagus
Timor-Leste	M/F	7 ICI 3.4-14.2 CR 0.53	No data	No data	44 ICI 23.2-83.5 CR 3.3	No data	4 ICI 2.2 - 7.4 CR 0.30	4 ICI 1.9-8.5 CR 0.30	The higher incidence is Lip and Oral cavity cancers
Togo	M/F	56 ICI 39.7 – 79.0 CR 0.70	54 ICI 36.2-80.6 CR 0.68	33 ICI 19.0-57.4 CR 0.41	16 ICI 9.8-26.3 CR 0.20	2 ICI 1.0-3.9 CR 0.03	103 ICI 76.7-138.3 CR 1.3	60 ICI 41.8-86.1 CR 0.75	The higher incidence is Oesophagus
Tuvalu	M/F	No data	No data	No data	No data	No data	No data	No data	Non data available.
Uganda	M/F	271 ICI 164.0-447.7 CR 0.61	120 ICI 78.5 -183.5 CR 0.27	107 ICI 61.3 – 186.8 CR 0.24	342 ICI 214.4 - 545.5 CR 0.77	50 ICI 24.3 103.1 CR 0.11	1 749 ICI 1407.4-2173.6 CR 4.0	177 ICI 98.5 - 317.9 CR 0.40	The higher incidence is Lip and Oral cavity cancers

Country	Gender	Lip and oral cavity cancers (C00-06)	Salivary glands (C07-08)	Oropharynx cancer (C09-10)	Nasopharynx (C11)	Hipopharynx cancer (C12-13)	Oesophagus (C15)	Larynx (C32)	Main findings
United Republic of Tanzania,	M/F	1098 ICI 686.2-1756.9 CR 1.9	178 ICI 98.1-323.1 CR 0.30	115 ICI 46.7-283.3 CR 0.19	529 ICI 321.7-869.9 CR 0.90	278 ICI 874-916.2 CR 0.47	2516 ICI 1843.2-3,434.4 CR 4.3	521 ICI 240.3-1129.6 CR 0.88	The higher incidence is Lip and Oral cavity cancers
Vanuatu	M/F	5 ICI 1.6-15.7 CR 1.8	1 ICI 0.40-2.5 CR 0.35	No data	No data	No data	No data	2 ICI 0.80-5.3 CR 0.71	The higher incidence is Lip and Oral cavity cancers
Yemen	M/F	219 ICI 176.5-271.8 CR 0.76	152 ICI 108.3-213.4 CR 0.53	45 ICI 20.1 -100.9 CR 0.16	313 ICI 255.4 – 383.6 CR 1.1	9 ICI 4.9-16.5 CR 0.03	785 ICI 641.5 – 960.7 CR 2.7	264 CI 187.4-371.9 CR 0.91	The higher incidence is Lip and Oral cavity cancers
Zambia	M/F	90 ICI 54.7 – 148.1 CR 0.51	55 ICI 35.9-84.2 CR 0.31	13 ICI 5.0 - 33.7 CR 0.07	56 ICI 36.8-85.2 CR 0.32	11 ICI 3.4-35.4 CR 0.06	389 ICI 266.6 -567.6 CR 2.2	65 CI 33.3-126.8 CR 0.37	The higher incidence is Oesophagus

ICI = Incidence Confidence Interval CR =Crude Ratio.