BMJ Open

High costs of management of oral cancer in Sri Lanaka mandate prevention as priority

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2018-027661
Article Type:	Research
Date Submitted by the Author:	20-Nov-2018
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Keywords:	Oral cancer, System cost, Household cost, Out of pocket expenditure

High costs of management of oral cancer in Sri Lanaka mandate prevention as priority

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Abstract

Objective

This study aimed to estimate the total costs of management of Oral Cancer (OCA) in Sri Lanka over the first 12 months from diagnosis in the year 2016.

Design

Hospital based costing study

Settings

Selected two cancer treatment centers in Sri Lanka

Participants

Sixty nine OCA patients were participated for this study, among them 60 were males. Twelve patients were reported with recurrences.

Outcomes

Estimates were conducted from a societal (healthcare, household and indirect cost) perspective. Costs to the healthcare system included surgery, ICU care, chemotherapy and radiotherapy; capital costs including estimated value for land, buildings, equipment and furniture. Household costs consisted of out of pocket expenditure for healthcare and indirect costs for lost income due to absenteeism for the patient and any companion. Costs were estimated according to the stage of presentation for treatment at first visit to one year of follow-up.

Results: Mean cost to the health system for management of a single Stage 11 OCA patient was Rs 58979.42 (US$ 393.72 considering the midyear exchange rate in the year 2016). Mean household cost was Rs 121,516.33 (US$ 811.19). The management of each Stage 111 or 1V OCA patient over one year cost the health system Rs 303619.7 (US$ 2026.83), with household costs of Rs 128,939.77 (US$ 860.75) per patient.

Conclusions: Owing to the high incidence of OCA in Sri Lanka, the economic costs associated with these diseases are enormous, resulting in negative impacts on both the healthcare system and individual families, thus impacting the country's economy. Policy makers should take note of this burden and take immediate steps for prevention and control of OCA.

Funding: University of Peradeniya, Sri Lanka Grant No. 2013/22.

Keywords: Oral cancer, System cost, Household cost, Out of pocket expenditure, Sri Lanka

Strengths and limitation of the study

- The findings add unique value as such costing methodology has been used for the first time in low socio-economic settings
- Unique methodology developed in this study could be replicated in countries with high prevalence of oral cancer for cost analysis.
- The findings of this study provide a baseline for economic evaluation of future interventions in oral cancer.
- Oral cancer is a considerable economic burden to the society and the health system. This mandates a strong need for primary and secondary prevention.
- Policy makers could be influenced to implement the existing regulations and to develop strong legislative framework for control of use of tobacco, areca nut and alcohol.

Introduction

Oral cancer, and cancers of the tonsil and other pharyngeal sites (ICD O C00-C14), thus excluding the nasopharynx (ICD O 11), taken together, constitute the ninth most common cancer in the world. There were an estimated 442,760 new cases worldwide in the period around 2012,[1] with 241,458 deaths, making these conditions the 11th most common for global cancer deaths. Fifty-six per cent of the world's oral and pharyngeal cancer burden (excluding nasopharyngeal carcinoma) is from Asia.[1] In Sri Lanka, the incidence of oral and pharyngeal cancer combined (excluding nasopharynx) was estimated at 15.5 per 100,000 population per annum, and 3981 new cases were estimated in 2012.[1] The incidence of cancer of the lip, oral cavity and pharynx was estimated at 20.7 and 5.4 per 100,000 population per annum, in males and females respectively.[1] Fourteen point three percent of all reported cancers were oral and pharyngeal cancers and these carried the highest mortality rate among different types of cancers.[2] OCA is the most common cancer amongst Sri Lankan males, 6th among women, and second overall, with 1564 new cases reported in year 2010.[2]

Incidence and prevalence approaches have been used to assess the cost of cancer care in the world. The incidence-based approach assesses the costs of new cases reported in a year as well as life-time costs. The prevalence-based approach assesses all new and old cases reported in a year. Life-time costs include expenditure from diagnosis to death. There are some examples of the cost of management of head and neck cancer from developed countries. A cross sectional study from New Zealand reported that cost of management of patients undergoing major Head and Neck cancer surgery was NZ$ 22,694 per patient.[3] In England, the cost of treating oral and oropharyngeal carcinoma was £ 213 million for a 5 year period. The cost of treatment for oral and oropharyngeal carcinoma in the USA per patient was US$ 13513 for stage 1V over 3 years.[4] In Sri Lanka 3.5% of the GDP is spent on the health budget. Of that, SLR 5945.5 million (2.3% of the current health expenditure) were spent in treating neoplasms.[5] Sri Lanka is one of the countries which provide a totally free health care service to all citizens. There is no published information on the cost of care for OCA patients in Sri Lanka. This study aims to establish this information by conducting a costing exercise within the Sri Lankan health system.

Methods

A descriptive cross-sectional study with cost analysis was conducted using activity-based costing with cost apportionment and step down costing approach. The study was conducted in selected cancer treatment centres in Sri Lanka: the University Dental Hospital Peradeniya (PDH), Apeksha Hospital, Maharagama and Oro-maxillofacial units of General Hospital Kalutara and Kegalle. As both Apeksha Hospital and PDH are centres of excellence for treatment of OCA and treat most of the cases in the nation, it is justifiable to include these two institutions for the cost analysis of the treatment of OCA. Two Oral and Maxillofacial (OMF) units were selected randomly from the 25 units across the nation. Sixty nine patients with histopathologically confirmed OCA were selected for data collection. These patients had squamous cell carcinomas of the oral cavity, arising from the buccal mucosa, retro-molar areas, oral (anterior two thirds) of the tongue, floor of the mouth, hard palate, and lips: malignancies of the nasopharynx, oropharynx, hypopharynx and other pharynx were excluded.

Trained data collectors were used. Patients admitted to the oncology or oncosurgery wards for treatment during the year 2016 were recruited. All patients had a minimum of one-year follow-up with data being collected

throughout a 12 month period. Information regarding the type and stage of the disease, type of treatment procedures and other treatment related details were obtained from the patient records. An interviewer administered a questionnaire to collect information from the patients regarding their socio-demographic information and indirect costs.

The study considered two major types of cost: health system costs and household costs. Health system costs included recurrent and capital costs. Recurrent costs consisted of overhead activities (such as utility and supportive services and administrative personnel), intermediate activities (such as salaries of clinicians, medicines and consumables) and costs associated with clinic visits. Capital costs included land value, buildings and equipment. Apportion of the times of personnel, equipment depreciation, utility services and supportive services to the activity were derived from discussion with experts in the field: medical specialists and personnel involved in these activities. Cost information of the hospital (salaries, utility and supportive services, equipment purchases and equipment values) were obtained from account ledgers, financial reports, pay sheets and expenditure reports of financial departments of the hospitals. Costs of drugs and consumables were obtained from price lists of Medical Supplies Division of the government. Service-related details were obtained from annual statistical bulletins of the hospitals. A standard data collection format was used to record this information.

Face and Content validity were ensured by pilot testing of the checklist and questionnaire in Apeksha Hospital with patients other than OCAs and discussions with experts in the field. Cost data were collected from records in various administrative and financial offices, and from patients when collecting data for household costs. A 10% sample of the questionnaires was rechecked with clinic and BHT records by the first author to enhance the validity and reliability of data.

Data Analysis

The opportunity cost of personnel time per minute was derived by dividing their monthly basic salary by minutes per month [30 (Days) x 24 (Hours) x 60 (Minutes)]. For each intermediate activity, total cost per investigation or procedure was calculated and for each final activity (Clinic, Ward and ICU) cost per patient per day was calculated. Finally, for each patient, a list of final and intermediate activities and number of times that the patient underwent each activity for a period of 12 months were listed using a standard data collection format. The patient cost was the cumulative cost of all these activities. Patients were interviewed to obtain out of pocket expenditure, transport costs, and other indirect costs. Total costs per patient per day, for patients diagnosed with different stages of OCA, were calculated separately. Costs for inward patients and OPD patients who attended review clinics were derived separately.

Ethical approval was obtained from the Ethics Review Committee of the Faculty of Medicine, University of Colombo and informed written consent was obtained from all patients before data collection.

Patients and public involvement

Patients were not involved in the development of the research question and designing stage of the study.

Overall results were returned to them during the quarterly meetings of the 'Voice of Blue Pea' patients group which is an oral cancer victim group established in the main cancer treatment centres in Sri Lanka.

Results

Of 69 OCA patients, 60 were males. Age ranged from 40 years to 81 years and 78% of the patients were less than 60 years of age. Most (66%) patients were from disadvantaged backgrounds. Moreover, 12 patients were reported with recurrence; only 6 OCA patients were in stage 11, the remainder being stage 111 and 1V (Table 1). Eighty percent of the OCA patients reporting to these cancer treatment centres were chewers of betel quid: 48% were smokers and 67% were consuming alcohol regularly. Among the betel-chewing patients, the mean number of quids chewed was 6.9 quids per day (range 0-25); mean number of cigarettes and/or Bidi was 4 per day (range 0-25).

Table 1: Socio-demographic characteristics OCA patients

Characteristics	OCA patients	Percentage
Sex		
Male	60	87.0
Female	9	13.0
Age		
Years 40-50	17	24.6
50-60	30	43.5
60-70	12	17.4
Above 70 years	10	14.5
Education		
No education	7	10.1
Up to GCE Ordinary /Level exam	55	79.7
GCE Advance Level & Postgraduate	7	10.1
Stage of the diagnosis		
Stage 11	6	8.7
Stage 111	37	53.7
Stage 1V	26	37.7
Recurrences	12	17.4
Total	69	100

The present study also assessed the average monthly income and average expenditure on presumptively deleterious lifestyle habits. Average monthly income of the OCA patients was Rs 20 668.75 (US$ 137.98) and Rs 3003 (US$ 20.05) was spent on betel chewing monthly (Table 2). On average, a total of Rs 10,299.52 (US$

68.76) was spent monthly by each of the 40% of patients who practiced these habits. This amounts to approximately half of each patient's average monthly income.

Table 2- Average monthly income and money spent on habits by OCA patients

Monthly income & expenditure for lifestyle habits	Amount in Rs (Range in Rs)
Monthly Income	
Average patient monthly income	20 668.75 (800- 150,000) (US$ 137.98)
Patients Household average monthly income	24 728.07 (4000- 150,000) (US$ 165.07)
Average Expenditure for Habits	
Monthly expenditure for areca nut/betel quid chewing	3003.00 (300- 10,740) (US$ 20.05)
Monthly expenditure for tobacco smoking	3 214.20 (0- 10 500) (US$ 21.46)
Monthly expenditure for consumption of alcohol	4082.32 (0- 22 400) (US$ 27.25)

Costings were calculated according to the stage of presentation to the hospital for treatment for a one-year period. The System cost of management of a single Stage 11 OCA patient was Rs 58,979.42 (US$ 393.72) plus household costs of Rs 121,516.33 (US$ 811.19) (Table 3).

Table 3: Summary of cost items for management of one OCA patient in stage 11 and stage 111&1V for one year (2017 Sri Lankan rupees)

	Cost Categories	OCA (Stage 11)	OCA (Stage 111 and 1V)
System Cost	Recurrent Cost (including staff overhead cost of 526.91 (US$ 3.52)	57090.98 (US$ 381.11)	301731.26 (US$ 2014.23)
	Capital Cost	1,888.44 (US$ 12.61)	1,888.44 (US$ 12.61)
	Total System Cost	58979.42 (US$ 393.72)	303619.7 (US$ 2026.83)
Household Cost	Direct Cost (OOPE)	82,154.64 (US$ 548.43)	89,578.08 (US$ 597.98)
	Indirect Cost	39,361.69 (US$ 262.76)	39,361.69 (US$ 262.76)
	Total Household Cost	121,516.33 (US$ 811.19)	128,939.77 (US$ 860.75)
Total cost		**180495.75 (US$ 1204.91)**	**432559.47 (US$ 2887.58)**

System cost was Rs 303619.7 (US$ 2026.83) and house hold cost was Rs 128939.77 (US$ 860.75) for management of stage 111 and 1V one OCA patient for one-year follow-up.

Discussion

Compared with the other cancers, OCA is a preventable cancer because of its strong association with habits of areca nut/betel quid chewing, tobacco use and alcohol misuse. The majority of OCAs which present in Low and Middle Income countries arise from a potentially malignant disorder. Unfortunately, most patients with OCA present late to clinics with advanced disease.[6] Every year around 1500-2000 new cases of OCA are diagnosed in Sri Lanka,[2] where almost all patients then receive treatment from State hospitals. As the country has universal free health services, costs are borne by government. In addition, the patient and his/her immediate family have to bear many indirect costs which can be catastrophic for them. To date, no proper cost analysis has been done in the country to identify the actual direct and indirect cost for the management of OCA and to compare it with preventive measures to identify the cost effectiveness.

The study attempted to calculate total costs of management of different stages of OCA for the first time in Sri Lanka. The hospital records of many of these patients were incomplete, and no billing system was in place in the hospitals. Use of advanced investigations, types of surgeries performed, use of radiotherapy and chemotherapy, vary from centre to centre, and operator to operator. Facilities in State sector hospitals are severely limited, leading to suboptimal use of diagnostic and staging investigations, and many of the treatment modalities used may have been far from international standard. Costs derived may not represent ideal outcomes from the patient perspective, but reflect the actual situation in the nation. Many costs may have been underestimated due to the difficulties in collecting accurate information from hospital records. Similar difficulties have been reported by others in collecting accurate cost data. [7]

For a patient with Stage II OCA, system cost of management was approximately Rs 58,979 (US$ 393.72) and household cost around Rs 121,516.33 (US$ 811.19) for a patient with stage III or IV, system cost was around Rs 303,619.70 (US$ 2026.83) and household cost around Rs 128,939.77 (US$ 860.75). This demonstrated a significant increase in the system cost of management with advanced disease. We did not encounter cases with stage I OCA for cost analysis but can reasonably assume that it is less than stage II cases. This finding is consistent with the findings of other similar studies.[7 8] Our results highlight the importance of early diagnosis of oral cancer, not only to improve survival and the patient's quality of life, but also to minimise costs to the health system

In Greece in 2002, the average cost of treatment for a patient with OCA was estimated to be US$ 7,450 (~Rs 1,200,000) [7] whereas in the Netherlands in 2001, it was US$ 22,080 (Rs 3,315,000) [9] and in the United States of America in 1998, it was reported as US$ 32,500 (around Rs 4,875,000).[10] In the present study, the average cost for management of OCA was much lower, ~Rs350, 000 (~USD 2,300). In India,[11] average treatment cost for OCA was calculated at ~146,000 Indian rupees (~LKR 375,000 or USD 2400), similar to our values, although the majority of patients in the Indian study were Stage 1 and 11. Advanced rehabilitation of surgically treated patients, such as dental and facial prostheses were not provided to this cohort of patients. If the nation can move to provide such services, much higher costs will be incurred.

Conclusion

The cost of management of OCA patients in Sri Lanka is extremely high, in relation to mean per capita income and national GDP. This has negative impacts on both the health care system and on individual families and impacts the national economy. Most patients affected by this devastating disease are in low socio-economic category, burdening their families with catastrophic financial consequences. Early identification can reduce the cost of management of OCA significantly. Policy makers should take note of this burden and take immediate and effective steps to promote primary prevention and early detection of OCA.

Author contributions

All authors designed the study, generated hypothesis, interpreted the data and critically reviewed the manuscript. HA analysed the data and wrote the first draft, RJ contributed in data collecting and writing and editing the manuscript, DD and SK developed the data collection tools and developed the methodology. MA participated in data collection and in editing the manuscript, NJ and PS advised on study design and edited the manuscript.
All authors approved the final version.

Declaration of Interests

The authors declare no competing interests.

Data sharing statement

Data are available upon request to the corresponding author HA through email.

Acknowledgement

We gratefully acknowledge University of Peradeniya, Grant No. 2013/22. We acknowledge Dr Lakshmi Somatunga, Deputy Director General (MS1) for permission to conduct the study at Apeksha Hospital, Maharagama and other General Hospitals. We thank Consultant Oncologist at Apeksha Hospital, Maharagama and the Oral and Maxillofacial Surgeons Dr Suresh Shanmuganatha and Dr Kamal Kumara for allowing us to use their patient details. We acknowledge Mr Dinesh Kumara for take part in data entry and Drs G.U.Pahalavithana, S Gunawardana, A Gaythri and C Jayasinghe who helped with data collection.

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BMJ Open

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Journal:	*BMJ Open*
Manuscript ID	bmjopen-2018-027661.R1
Article Type:	Research
Date Submitted by the Author:	09-Mar-2019
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Primary Subject Heading:	Health economics
Secondary Subject Heading:	Oncology, Health economics, Dentistry and oral medicine
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Economic burden of managing oral cancer patients in Sri Lanka

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Abstract

Objective

Cancer of the oral cavity is the leading malignancy amongst males in Sri Lanka, and sixth among women. This study aimed to estimate costs of managing patients with oral cancer (OCA) in Sri Lanka for a 12 month period from diagnosis.

Design

Hospital based costing study

Settings

Four selected cancer treatment centers in Sri Lanka

Participants

Sixty nine OCA patients: 60 were males and 12 had recurrent tumours.

Outcome

Societal perspectives (healthcare, household and indirect costs) were itemised. Costs to the healthcare system included surgery, ICU care, chemotherapy and radiotherapy. Capital costs including apportioned value of land, buildings, equipment and furniture. Household costs consisted of out of pocket expenditure for healthcare and indirect costs of lost income. Costs were estimated from the stage of presentation for treatment to one year of follow-up.

Results: Mean cost of managing a single Stage II OCA patient for one year was SLR 58,979 (US$ 393.72, at the midyear exchange rate in 2016) to the health system. Mean household cost was SLR 77,649.21 (US$ 518.35). The annual cost of managing a Stage III or IV patient was SLR 303,619.70 (US$ 2026.83), with household costs of SLR 71,931.83 (US$ 480.18)

Conclusions: Owing to the high incidence of OCA in Sri Lanka, the economic costs associated with these diseases are enormous, resulting in negative impacts on both the healthcare system and individual families, seriously impacting the country's economy. Policy makers should take note of this burden and increase steps for prevention and control of this devastating disease.

Funding: University of Peradeniya, Grant No. 2013/22.

Keywords: Oral cancer, System cost, Household cost, Out of pocket expenditure, Sri Lanka

Strengths and limitations

- A unique methodology was developed to collect costing data in low socio-economic settings
- This methodology could be replicated in similar countries with high prevalence of oral cancer
- Arbitrary depreciation and personnel rates were taken due to unavailability of government validated costing algorithms
- Cost calculations could be incomplete due to missing records

Introduction

Oral cancer poses a huge challenge to the wellbeing of people worldwide, and more specifically in the Asian region. Here we define oral cancer as malignant neoplasms of lip, tongue and mouth (OCA). Taken together, these cancers were estimated to affect 354,864 people worldwide in 2018, with 177,384 deaths.[1] Fifty-six per cent of the world's oral and pharyngeal cancer burden (excluding nasopharyngeal carcinoma) is from Asia. The incidence of oral cancer for men was estimated at 14.8 per 100,000 population per annum in Globocan 2018. Incidence of oral cancer among men in Sri Lanka was 15.6 per 100,000 population as reported in 2014.[2] Oral cancer accounts for nearly 10% of reported cancers with the highest mortality rates of all cancers in Sri Lanka.[2]

Both incidence and prevalence approaches have been used to assess the costs of cancer care across the globe. The incidence-based approach assesses the costs of new cases reported in a year and then adds life-time costs. The prevalence-based approach assesses all new and old cases known in a single or particular year. Life-time costs include all expenditures from diagnosis to death. Several examples of the costs of managing head and neck cancer have been published from developed countries: A cross sectional study from New Zealand reported that cost as NZ$ 22,694 per patient.[3] In England, the cost of treating oral and oropharyngeal carcinoma was £ 213 million for a 5 year period. The cost of treatment for oral and oropharyngeal carcinoma in the USA per patient was reported as US$ 13,513 for each Stage 1V case over 3 years.[4]

In Sri Lanka 3.5% of GDP is spent on the health budget. Of that, Sri Lankan Rupees (SLR) 5945.5 million (2.3% of the current health expenditure) were spent in treating neoplasms.[5] Sri

Lanka a totally free health care service to all citizens. There is no published information on the cost of care for OCA patients in Sri Lanka. This study aims to establish this information by conducting a costing exercise within the Sri Lankan health system.

Methods

A descriptive cross-sectional study with cost analysis was conducted using activity-based costing with cost apportionment and step-down costing approach. The study was conducted in selected cancer treatment centres in Sri Lanka; the University Dental Hospital Peradeniya (PDH), Apeksha Hospital, Maharagama and Oro-maxillofacial units of General Hospital Kalutara and Kegalle. As both Apeksha Hospital and PDH are centres of excellence for treatment of OCA and treat most of the cases in the nation, it was important to include these two institutions. Two Oral and Maxillofacial (OMF) treatment units were selected randomly from the 25 units across the nation. Sixty nine patients with histopathological confirmation of OCA were selected for study. These patients had squamous cell carcinomas of the oral cavity, arising from the buccal mucosa, retro-molar areas, oral (anterior two thirds) of the tongue, floor of the mouth, hard palate, or lips: these are the common sites, with abuse of areca nut, smokeless and smoked tobacco, and alcohol, often in a background of diets deficient in essential macro- and micro-nutrients as the main risk factors: HPV-driven cancers are not prominent in these sites in this population.[6] Malignancies of the nasopharynx, oropharynx, hypopharynx and other pharynx were excluded.

Trained personal were used for data collection. Patients admitted to the oncology or onco-surgery wards for treatment during the year 2016 were recruited. All patients had a minimum of one-year follow-up with data being collected throughout a 12 month period. Information regarding the type and stage of the disease, treatment procedures and other related details were obtained from patient records. An interviewer-administered questionnaire was used to collect information from the patients regarding their socio-demographic situation and indirect costs incurred.

The study considered two major types of cost: health system costs and household costs. Health system costs included recurrent and capital costs. Recurrent costs consisted of overhead activities (such as utility and supportive services and administrative personnel), intermediate activities (such as salaries of clinicians, medicines and consumables) and costs associated with clinic visits. Capital costs included land value, buildings and equipment. Apportionment of the times of personnel, equipment depreciation, utility services and supportive services to the activity were derived from discussion with experts in the field: medical specialists and personnel involved in these activities. Cost information of the hospital (salaries, utility and supportive services, equipment purchases and equipment values) were obtained from account ledgers, financial reports, pay sheets and expenditure reports of financial departments of the hospitals. Costs of drugs and consumables were obtained from price lists of the Medical Supplies Division of government. Service-related details were obtained from annual statistical bulletins of the hospitals.

Household costs consisted of direct and indirect costs. Direct costs constituted all the components of out-of-pocket expenditures during the study period for medicines, investigations, travel and food. Indirect costs included opportunity cost for the patient and his/her main carer which were incurred due to clinic visits or hospital days. Opportunity cost per day was calculated by dividing the monthly income of such individuals by days per month [30 (Days)]. A standardised data collection form was used to record this information.

Face and Content validity were ensured by pilot testing of the checklist and questionnaire in Apeksha Hospital with patients other than OCAs and discussions with experts in the field. Cost data were collected from records in various administrative and financial offices, and from patients when collecting data for household costs. A 10% sample of the questionnaires was rechecked with clinic and BHT records by the first author to enhance the validity and reliability of data.

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The opportunity cost of personnel time per minute was derived by dividing their monthly basic salary by minutes per month [30 (Days) x 24 (Hours) x 60 (Minutes)]. For each intermediate activity, total cost per investigation or procedure was calculated and for each final activity (Clinic, Ward and ICU) cost per patient per day was calculated. Finally, for each patient, a list of final and intermediate activities and number of times that the patient underwent each activity for a period of 12 months were listed using a standard data collection

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Patients were not involved in the development of the research questions and design stage of the study. Overall results were returned to patients during the quarterly meetings of the 'Voice of Blue Pea' Patient Group which is an oral cancer victim group established in the main cancer treatment centres in Sri Lanka.

Results

Of 69 OCA patients, 60 were male. Age ranged from 40 to 81 years and 78% of the patients were less than 60 years of age. Most (66%) patients were from disadvantaged backgrounds. Twelve patients had presented with recurrence. Only six OCA patients were in stage II, the remainder being stage III and IV (Table 1). Eighty percent of the OCA patients reporting to these cancer treatment centres were chewers of betel quid, 48% were smokers and 67% were consuming alcohol regularly. Among the areca nut/betel-chewing patients, the mean number of quids chewed was 6.9 quids per day (range 0-25); mean number of cigarettes and/or Bidi sloked was 4 per day (range 0-25).

Table 1: Socio-demographic characteristics OCA patients

Characteristics	OCA patients	Percentage
Sex		
Male	60	87.0
Female	9	13.0
Age		
Years 40-50	17	24.6
50-60	30	43.5
60-70	12	17.4
Above 70 years	10	14.5
Education		
No formal education	7	10.1
Up to General Certificate of Education (GCE) Ordinary /Level exam	55	79.7
GCE Advanced Level & Postgraduate	7	10.1
Stage of diagnosis		
Stage 11	6	8.7
Stage 111	37	53.7
Stage 1V	26	37.7
Recurrences	12	17.4
Total	69	100

The present study also assessed the average monthly income and average expenditure on presumptively deleterious lifestyle habits. Average monthly income of the OCA patients was SLR 20 668.75 (US$ 137.98) and SLR 3003 (US$ 20.05) was spent on betel quid chewing monthly (Table 2). On average, a total of SLR 10,299.52 (US$ 68.76) was spent monthly by

each of the 40% of patients who practiced these habits. This amounts to approximately half of each patient's average monthly income.

Table 2- Average monthly income and money spent on habits by OCA patients

Monthly income & expenditure for lifestyle habits	Amount in SLR (Range in SLR)
Monthly Income	
Average patient monthly income	20,668.75 (800 - 150,000) (US$ 137.98)
Patients Household average monthly income	24,728.07 (4000 - 150,000) (US$ 165.07)
Average Expenditure for Habits	
Monthly expenditure for areca nut/betel quid chewing	3,003.00 (300 - 10,740) (US$ 20.05)
Monthly expenditure for tobacco smoking	3,214.20 (0 - 10 500) (US$ 21.46)
Monthly expenditure for consumption of alcohol	4,082.32 (0 - 22 400) (US$ 27.25)

The mean cost of managing a stage II oral cancer patient was SLR 136,628 (Table 3).The highest portion of this was the health system cost. Direct and indirect household cost was higher than the health system cost. A patient had to bear about 28% of the total cost paying as out of pocket expenditure and 41% total cost as direct treatment-related expenses.

Table 3- The health system cost and household cost of managing single stage 11 oral cancer patient for one year

Cost category	Item	Cost in SLR
System		
Recurrent cost	Clinic visit	272.73
	Biopsy	1,399.16
	Dental Extraction	337.39
	X Ray	532.23
	Scan	254.8
	Lab	636.13
	Ward management	7983.36
	Surgery	41,946.17
	Surgery Consumables	202.07
	Follow up Clinic Visit	3,000.03
	Staff Overhead cost	526.91
	Total	57,090.98 (US$ 381.12)
Capital cost	Land	145.32
	Building	158.28
	Furniture	1,584.84
	Total	1,888.44 (US$ 12.6)
Household cost		
Direct cost (OOPE)	Medicines/investigations	18,200
	Travel	11,248.8
	Food	8,838.72
	Total	38,287.52 (US$ 255.59)
Indirect costs	Patient_Stay Home	8,857.81
	Patient_ward Days	8,176.44
	Patient Clinic	8,176.44
	Carer cost ward	7,839.96
	Companion Clinic Visit	6,311.04

	Total	39,361.69 (US$ 262.76)
Total cost		136,628.63 (US$ 912.07)

Cost of managing stage a 111 and 1V patient with oral cancer was higher than a stage 11 patient. The total cost per patient was SLR 375,551(Table 4). The highest cost portion was borne by the health system. The out-of-pocket cost for the patient was 8.7% of the total cost.

Table 4- The health system cost and household cost of managing a single Stage 111 and 1V oral cancer patient for one year

Cost category	Item	Cost in SLR
System cost		
Recurrent cost	Clinic visit	272.73
	Biopsy	1,399.16
	Dental extractions	337.39
	Dental restorations	415.09
	X Ray	532.23
	Scan	254.8
	CT Scan	1,093.76
	Lab	1,062.38
	Ward management	7,983.36
	Surgery	50,383.12
	Surgery Consumables	189.58
	ICU ward Management	113,781.8
	ICU Investigation	998.12
	Radiotherapy	55,818
	Chemotherapy	63,682.8
	Follow-up Clinic Visit	3,000.03
	Staff Overhead cost	526.91
	Total	**301,731.26 (US$ 2011.54)**
Capital cost	Land	145.32
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	Furniture	1,584.84
	Total	1,888.44 (US$ 12.6)
Household cost		
Direct cost (OOPE)	Medicines/ investigations	12,059.40
	Travel	10,126.2
	Food	10,384.56
	Total	**32,570.14 (US$ 217.42)**
Indirect costs	Patient stay home	8,857.81
	Patient_ward days	8,176.44
	Patient clinic	8,176.44
	Carer cost ward	7,839.96
	Companion clinic visit	6,311.04
	Total	39,361.69 (US$ 262.76)
Total cost		**375,551.53 (US$ 2507.02)**

Discussion

This is the first study in calculating cost of OCA in the South Asian region where oral cancer is highly prevalent. We found very high out-of- pocket costs for all patients, most of whom are from low socio-economic backgrounds. The methodology developed in this study can be of relevance to similar economies in calculating cost of any diseases.

Compared with the other cancers, OCA is a preventable cancer because of its strong association with habits of areca nut/betel quid chewing, tobacco use and alcohol misuse. The majority of OCAs which present in low and Middle Income countries arise from a potentially malignant disorder. Unfortunately, most patients with OCA present with advanced disease.[7] Every year around 1500-2000 new cases of OCA are diagnosed in Sri Lanka,[2] where almost all patients then receive treatment from State hospitals. As the country has universal free health services, costs are borne by government. In addition, the patient and his/her immediate family have to bear many indirect costs which can be catastrophic for them. To date, no proper cost analysis has been done in the country to identify the actual direct and indirect cost for the management of OCA and to compare it with preventive measures to identify the cost effectiveness.

The study attempted to calculate total costs of management of different stages of OCA for the first time in Sri Lanka. The hospital records of many of these patients were incomplete, and no billing system was in place in the hospitals. Use of advanced investigations, types of surgeries performed, use of radiotherapy and chemotherapy, vary from centre to centre, and operator to operator. Facilities in State sector hospitals are severely limited, leading to suboptimal use of diagnostic and staging investigations, and many of the treatment modalities used may have been far from international standard. Costs derived may not represent ideal outcomes from the patient perspective, but reflect the actual situation in the nation. Many costs may have been underestimated due to the difficulties in collecting accurate information from hospital records. Similar difficulties have been reported by others in collecting accurate cost data. [8]

For a patient with Stage 11 OCA, system cost of management was approximately SLR 58,979 (US$ 393.72) and household cost around SLR 77,649.21 (US$ 518.35). For a patient with stage III or IV disease, system cost was around SLR 303,619.70 (US$ 2026.83) and household cost around SLR 71,931.83 (US$ 480.18). We did not encounter cases with stage I OCA for cost analysis but can reasonably assume that it is less than stage II cases. This finding is consistent with the findings of other similar studies.[8 9] Our results highlight the importance of early diagnosis of oral cancer, not only to improve survival and the patient's quality of life, but also to minimise costs to the health system

In Greece in 2002, the average cost of treatment for a patient with OCA was estimated to be US$ 7,450 (~SLR 1,200,000) [8] whereas in the Netherlands in 2001, it was US$ 22,080 (SLR 3,315,000) [10] and in the United States of America in 1998, it was reported as US$ 32,500 (around SLR 4,875,000).[11] In the present study, the average cost for management of OCA was much lower, ~SLR350, 000 (~USD 2,300). In India,[12] average treatment cost for OCA was calculated at ~146,000 Indian rupees (~LKR 375,000 or USD 2400), similar to our values, although the majority of patients in the Indian study were Stage 1 and 11. Advanced rehabilitation of surgically treated patients, such as dental and facial prostheses were not provided to this cohort of patients. If the nation can move to provide such services, much higher costs will be incurred.

Conclusion

The cost of management of OCA patients in Sri Lanka is extremely high, in relation to mean per capita income and national GDP. This has negative impacts on both the health care system and on individual families and impacts the national economy. Most patients affected by this devastating disease are in low socio-economic category, burdening their families with catastrophic financial consequences. Early identification can reduce the cost of management of OCA significantly. Policy makers should take note of this burden and take immediate and effective steps to improve primary prevention and early detection of OCA.

Author contributions

All authors designed the study, generated hypotheses, interpreted the data and critically reviewed the manuscript. HA analysed the data and wrote the first draft, RJ contributed in data collecting and writing and editing the manuscript, DD and SK developed the data collection tools and developed the methodology. MA participated in data collection and in editing the manuscript, NJ and PS advised on study design and edited the manuscript.
All authors approved the final version.

Declaration of Interests

The authors declare no competing interests.

Data sharing statement

Data are available upon request to the corresponding author HA through email.

Acknowledgements

We gratefully acknowledge University of Peradeniya, Grant No. 2013/22. We acknowledge Dr Lakshmi Somatunga, Deputy Director General (MS1) for permission to conduct the study at Apeksha Hospital, Maharagama and other General Hospitals. We thank consultant oncologists at Apeksha Hospital, Maharagama and the Oral and Maxillofacial Surgeons Dr Suresh Shanmuganatha and Dr Kamal Kumara for allowing us to use their patient details. We acknowledge Mr Dinesh Kumara for assisting with data entry and Drs G.U.Pahalavithana, S Gunawardana, A Gaythri and C Jayasinghe for help with data collection.

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BMJ Open

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Journal:	*BMJ Open*
Manuscript ID	bmjopen-2018-027661.R2
Article Type:	Research
Date Submitted by the Author:	26-Apr-2019
Complete List of Authors:	Amarasinghe, Hemantha; Institute of Oral health, Ministry of Health Jayasinghe, Ruwan; Department of Oral Medicine and Periodontology, Faculty of Dental Sciences Dharmagunawardene, Dilantha; Education, Training and Research unit, Ministry of Health, Nutrition and Indigenous Medicine Attygalla, Manjula; Faculty of Dental Sciences, University of Peradeniya, Department of Oral Surgery Scuffham, Paul; Griffith University, Griffith Health Institute and School of Medicine Johnson, Newell ; Griffith University - Gold Coast Campus, Kularatna, Sanjeewa; Institute of Health and Biomedical Innovation
Primary Subject Heading:	Health economics
Secondary Subject Heading:	Oncology, Health economics, Dentistry and oral medicine
Keywords:	Oral cancer, System cost, Household cost, Out of pocket expenditure

Economic burden of managing oral cancer patients in Sri Lanka

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Abstract

Objective

Cancer of the oral cavity is the leading malignancy amongst males in Sri Lanka, and sixth among women. This study aimed to estimate costs of managing patients with oral cancer (OCA) in Sri Lanka for a 12 month period from diagnosis.

Design

Hospital based costing study

Settings

Four selected cancer treatment centers in Sri Lanka

Participants

Sixty nine OCA patients: 60 were males and 12 had recurrent tumours.

Outcome

Societal perspectives (healthcare, household and indirect costs) were itemised. Costs to the healthcare system included surgery, ICU care, chemotherapy and radiotherapy. Capital costs including apportioned value of land, buildings, equipment and furniture. Household costs consisted of out of pocket expenditure for healthcare and indirect costs of lost income. Costs were estimated from the stage of presentation for treatment to one year of follow-up.

Results: Mean cost of managing a single Stage II OCA patient for one year was SLR 58,979 (US$ 394, at the midyear exchange rate in 2016) to the health system. Mean household cost was SLR 77,649 (US$ 518). The annual cost of managing a Stage III or IV patient was SLR 303,620 (US$ 2027), with household costs of SLR 71,932 (US$ 480)

Conclusions: Owing to the high incidence of OCA in Sri Lanka, the economic costs associated with these diseases are enormous, resulting in negative impacts on both the healthcare system and individual families, seriously impacting the country's economy. Policy makers should take note of this burden and increase steps for prevention and control of this devastating disease.

Funding: University of Peradeniya, Grant No. 2013/22.

Keywords: Oral cancer, System cost, Household cost, Out of pocket expenditure, Sri Lanka

Strengths and limitations

- A unique methodology was developed to collect costing data in low socio-economic settings
- This methodology could be replicated in similar countries with high prevalence of oral cancer
- Arbitrary depreciation and personnel rates were taken due to unavailability of government validated costing algorithms
- Cost calculations could be incomplete due to missing records

Introduction

Oral cancer poses a huge challenge to the wellbeing of people worldwide, and more specifically in the Asian region. Here we define oral cancer as malignant neoplasms of lip, tongue and mouth (OCA). Taken together, these cancers were estimated to affect 354,864 people worldwide in 2018, with 177,384 deaths.[1] Fifty-six per cent of the world's oral and pharyngeal cancer burden (excluding nasopharyngeal carcinoma) is from Asia. The incidence of oral cancer for men was estimated at 14.8 per 100,000 population per annum in Globocan 2018. Incidence of oral cancer among men in Sri Lanka was 15.6 per 100,000 population as reported in 2014.[2] Oral cancer accounts for nearly 10% of reported cancers with the highest mortality rates of all cancers in Sri Lanka.[2]

Both incidence and prevalence approaches have been used to assess the costs of cancer care across the globe. The incidence-based approach assesses the costs of new cases reported in a year and then adds life-time costs. The prevalence-based approach assesses all new and old cases known in a single or particular year. Life-time costs include all expenditures from diagnosis to death. Several examples of the costs of managing head and neck cancer have been published from developed countries: A cross sectional study from New Zealand reported that cost as NZ$ 22,694 per patient.[3] In England, the cost of treating oral and oropharyngeal carcinoma was £ 213 million for a 5 year period. The cost of treatment for oral and oropharyngeal carcinoma in the USA per patient was reported as US$ 13,513 for each Stage 1V case over 3 years.[4]

In Sri Lanka 3.5% of GDP is spent on the health budget. Of that, Sri Lankan Rupees (SLR) 5945.5 million (2.3% of the current health expenditure) were spent in treating neoplasms.[5] Sri

Lanka a totally free health care service to all citizens. There is no published information on the cost of care for OCA patients in Sri Lanka. This study aims to establish this information by conducting a costing exercise within the Sri Lankan health system.

Methods

A descriptive cross-sectional study with cost analysis was conducted using activity-based costing with cost apportionment and step-down costing approach. The study was conducted in selected cancer treatment centres in Sri Lanka; the University Dental Hospital Peradeniya (PDH), Apeksha Hospital, Maharagama and Oro-maxillofacial units of General Hospital Kalutara and Kegalle. As both Apeksha Hospital and PDH are centres of excellence for treatment of OCA and treat most of the cases in the nation, it was important to include these two institutions. Two Oral and Maxillofacial (OMF) treatment units were selected randomly from the 25 units across the nation. Sixty nine patients with histopathological confirmation of OCA were selected for study. These patients had squamous cell carcinomas of the oral cavity, arising from the buccal mucosa, retro-molar areas, oral (anterior two thirds) of the tongue, floor of the mouth, hard palate, or lips: these are the common sites, with abuse of areca nut, smokeless and smoked tobacco, and alcohol, often in a background of diets deficient in essential macro- and micro-nutrients as the main risk factors: HPV-driven cancers are not prominent in these sites in this population.[6] Malignancies of the nasopharynx, oropharynx, hypopharynx and other pharynx were excluded.

Trained personal were used for data collection. Patients admitted to the oncology or onco-surgery wards for treatment during the year 2016 were recruited. All patients had a minimum of one-year follow-up with data being collected throughout a 12 month period. Information regarding the type and stage of the disease, treatment procedures and other related details were obtained from patient records. An interviewer-administered questionnaire was used to collect information from the patients regarding their socio-demographic situation and indirect costs incurred.

The study considered two major types of cost: health system costs and household costs. Health system costs included recurrent and capital costs. Recurrent costs consisted of overhead activities (such as utility and supportive services and administrative personnel), intermediate activities (such as salaries of clinicians, medicines and consumables) and costs associated with clinic visits. Capital costs included land value, buildings and equipment. Apportionment of the times of personnel, equipment depreciation, utility services and supportive services to the activity were derived from discussion with experts in the field: medical specialists and personnel involved in these activities. Cost information of the hospital (salaries, utility and supportive services, equipment purchases and equipment values) were obtained from account ledgers, financial reports, pay sheets and expenditure reports of financial departments of the hospitals. Costs of drugs and consumables were obtained from price lists of the Medical Supplies Division of government. Service-related details were obtained from annual statistical bulletins of the hospitals.

Household costs consisted of direct and indirect costs. Direct costs constituted all the components of out-of-pocket expenditures during the study period for medicines, investigations, travel and food. Indirect costs included opportunity cost for the patient and his/her main carer which were incurred due to clinic visits or hospital days. Opportunity cost per day was calculated by dividing the monthly income of such individuals by days per month [30 (Days)]. A standardised data collection form was used to record this information.

Face and Content validity were ensured by pilot testing of the checklist and questionnaire in Apeksha Hospital with patients other than OCAs and discussions with experts in the field. Cost data were collected from records in various administrative and financial offices, and from patients when collecting data for household costs. A 10% sample of the questionnaires was rechecked with clinic and BHT records by the first author to enhance the validity and reliability of data.

Data Analysis

The opportunity cost of personnel time per minute was derived by dividing their monthly basic salary by minutes per month [30 (Days) x 24 (Hours) x 60 (Minutes)]. For each intermediate activity, total cost per investigation or procedure was calculated and for each final activity (Clinic, Ward and ICU) cost per patient per day was calculated. Finally, for each patient, a list of final and intermediate activities and number of times that the patient underwent each activity for a period of 12 months were listed using a standard data collection

format. The patient cost was the cumulative cost of all these activities. Patients were interviewed to obtain out of pocket expenditure, transport costs, and other indirect costs. Total costs per patient per day, for patients diagnosed with different stages of OCA, were calculated separately. Costs for inward patients and OPD patients who attended review clinics were derived separately.

Ethical approval was obtained from the Ethics Review Committee of the Faculty of Medicine, University of Colombo and informed written consent was obtained from all patients before data collection.

Patients and public involvement

Patients were not involved in the development of the research questions and design stage of the study. Overall results were returned to patients during the quarterly meetings of the 'Voice of Blue Pea' Patient Group which is an oral cancer victim group established in the main cancer treatment centres in Sri Lanka.

Results

Of 69 OCA patients, 60 were male. Age ranged from 40 to 81 years and 78% of the patients were less than 60 years of age. Most (66%) patients were from disadvantaged backgrounds. Twelve patients had presented with recurrence. Only six OCA patients were in stage II, the remainder being stage III and IV (Table 1). Eighty percent of the OCA patients reporting to these cancer treatment centres were chewers of betel quid, 48% were smokers and 67% were consuming alcohol regularly. Among the areca nut/betel-chewing patients, the mean number of quids chewed was 6.9 quids per day (range 0-25); mean number of cigarettes and/or Bidi sloked was 4 per day (range 0-25).

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Characteristics	OCA patients	Percentage
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of patients who practiced these habits. This amounts to approximately half of each patient's average monthly income.

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Cost category	Item	Cost in SLR
System		
Recurrent cost	Clinic visit	273
	Biopsy	1,399
	Dental Extraction	337
	X Ray	532
	Scan	255
	Lab	636
	Ward management	7983
	Surgery	41,946
	Surgery Consumables	202
	Follow up Clinic Visit	3,000
	Staff Overhead cost	527
	Total	57,091 (US$ 381)
Capital cost	Land	145
	Building	158
	Furniture	1,585
	Total	1,888 (US$ 13)
Household cost		
Direct cost (OOPE)	Medicines/investigations	18,200
	Travel	11,249
	Food	8,839
	Total	38,287 (US$ 256)
Indirect costs	Patient_Stay Home	8,858
	Patient_ward Days	8,176
	Patient Clinic	8,176
	Carer cost ward	7,840
	Companion Clinic Visit	6,311

	Total	39,362 (US$ 263)
Total cost		136,629 (US$ 912.)

Cost of managing stage a 111 and 1V patient with oral cancer was higher than a stage 11 patient. The total cost per patient was SLR 375,551(Table 4). The highest cost portion was borne by the health system. The out-of-pocket cost for the patient was 8.7% of the total cost.

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	Lab	1,062
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	Surgery	50,383
	Surgery Consumables	190
	ICU ward Management	113,782
	ICU Investigation	998
	Radiotherapy	55,818
	Chemotherapy	63,683
	Follow-up Clinic Visit	3,000
	Staff Overhead cost	527
	Total	**301,731 (US$ 2011)**
Capital cost	Land	145
	Building	158

	Furniture	1,585
	Total	1,888 (US$ 13)
Household cost		
Direct cost (OOPE)	Medicines/ investigations	12,059
	Travel	10,126
	Food	10,385
	Total	**32,570 (US$ 217)**
Indirect costs	Patient stay home	8,858
	Patient_ward days	8,176
	Patient clinic	8,176
	Carer cost ward	7,840
	Companion clinic visit	6,311
	Total	39,362 (US$ 263)
Total cost		**375,551 (US$ 2507)**

Discussion

This is the first study in calculating cost of OCA in the South Asian region where oral cancer is highly prevalent. We found very high out-of- pocket costs for all patients, most of whom are from low socio-economic backgrounds. The methodology developed in this study can be of relevance to similar economies in calculating cost of any diseases.

Compared with the other cancers, OCA is a preventable cancer because of its strong association with habits of areca nut/betel quid chewing, tobacco use and alcohol misuse. The majority of OCAs which present in low and Middle Income countries arise from a potentially malignant disorder. Unfortunately, most patients with OCA present with advanced disease.[7] Every year around 1500-2000 new cases of OCA are diagnosed in Sri Lanka,[2] where almost all patients then receive treatment from State hospitals. As the country has universal free health services, costs are borne by government. In addition, the patient and his/her immediate family have to bear many indirect costs which can be catastrophic for them. To date, no proper cost analysis has been done in the country to identify the actual direct and indirect cost for the management of OCA and to compare it with preventive measures to identify the cost effectiveness.

The study attempted to calculate total costs of management of different stages of OCA for the first time in Sri Lanka. The hospital records of many of these patients were incomplete, and no billing system was in place in the hospitals. Use of advanced investigations, types of surgeries performed, use of radiotherapy and chemotherapy, vary from centre to centre, and operator to operator. Facilities in State sector hospitals are severely limited, leading to suboptimal use of diagnostic and staging investigations, and many of the treatment modalities used may have been far from international standard. Costs derived may not represent ideal outcomes from the patient perspective, but reflect the actual situation in the nation. Many costs may have been underestimated due to the difficulties in collecting accurate information from hospital records. Similar difficulties have been reported by others in collecting accurate cost data. [8]

For a patient with Stage 11 OCA, system cost of management was approximately SLR 58,979 (US$ 393.72) and household cost around SLR 77,649 (US$ 518). For a patient with stage III or IV disease, system cost was around SLR 303,620 (US$ 2027) and household cost around SLR 71,932 (US$ 480). We did not encounter cases with stage I OCA for cost analysis but can reasonably assume that it is less than stage II cases. This finding is consistent with the findings of other similar studies.[8 9] Our results highlight the importance of early diagnosis of oral cancer, not only to improve survival and the patient's quality of life, but also to minimise costs to the health system

In Greece in 2002, the average cost of treatment for a patient with OCA was estimated to be US$ 7,450 (~SLR 1,200,000) [8] whereas in the Netherlands in 2001, it was US$ 22,080 (SLR 3,315,000) [10] and in the United States of America in 1998, it was reported as US$ 32,500 (around SLR 4,875,000).[11] In the present study, the average cost for management of OCA was much lower, ~SLR350, 000 (~USD 2,300). In India,[12] average treatment cost for OCA was calculated at ~146,000 Indian rupees (~LKR 375,000 or USD 2400), similar to our values, although the majority of patients in the Indian study were Stage 1 and 11. Advanced rehabilitation of surgically treated patients, such as dental and facial prostheses were not provided to this cohort of patients. If the nation can move to provide such services, much higher costs will be incurred.

Conclusion

The cost of management of OCA patients in Sri Lanka is extremely high, in relation to mean per capita income and national GDP. This has negative impacts on both the health care system and on individual families and impacts the national economy. Most patients affected by this devastating disease are in low socio-economic category, burdening their families with catastrophic financial consequences. Early identification can reduce the cost of management of OCA significantly. Policy makers should take note of this burden and take immediate and effective steps to improve primary prevention and early detection of OCA.

Author contributions

All authors designed the study, generated hypotheses, interpreted the data and critically reviewed the manuscript. HA analysed the data and wrote the first draft, RJ contributed in data collecting and writing and editing the manuscript, DD and SK developed the data collection tools and developed the methodology. MA participated in data collection and in editing the manuscript, NJ and PS advised on study design and edited the manuscript.
All authors approved the final version.

Conflict of interest

None declared

Data sharing statement

Data are available upon request to the corresponding author HA through email.

Acknowledgements

We gratefully acknowledge University of Peradeniya, Grant No. 2013/22. We acknowledge Dr Lakshmi Somatunga, Deputy Director General (MS1) for permission to conduct the study at Apeksha Hospital, Maharagama and other General Hospitals. We thank consultant oncologists at Apeksha Hospital, Maharagama and the Oral and Maxillofacial Surgeons Dr Suresh Shanmuganatha and Dr Kamal Kumara for allowing us to use their patient details. We acknowledge Mr Dinesh Kumara for assisting with data entry and Drs G.U.Pahalavithana, S Gunawardana, A Gaythri and C Jayasinghe for help with data collection.

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