JAYADEVAN SREEDHARAN

Prevalence and Determinants of Tobacco Habit in Kollam district, Kerala, India

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ACADEMIC DISSERTATION
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UNIVERSITY OF TAMPERE

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1. INTRODUCTION

Tobacco is one of the major killers in the world today and linked with a number of diseases (Doll et al. 2004, Sargeant et al. 2001, Villablanca et al. 2000, Shafey et al. 2009, IARC, 1986). Statistics in 1990 showed tobacco smoking caused 24% of total deaths among men and 7% of total deaths among women in developed countries (Peto et al.1996).

Tobacco is grown in over 125 countries, and over four million hectares of land is used for tobacco cultivation. The five leading producers of tobacco leaves in the year 2001 are China, India, Brazil, USA and Turkey. China produced 2,661,000 metric tons of tobacco leaves in year 2001 while India was in the second position with 701,000 metric tons during the same year. It was estimated that over five trillion cigarettes are manufactured each year. Brazil is the largest exporter of the tobacco leaf and the Russian Federation and the USA are the largest importers. The USA exports approximately the same amount of tobacco that it imports.

China is the largest cigarette manufacturer in the world with India featuring as the second largest producer of tobacco (Mackay and Eriken 2002). The USA exports the highest quantity of manufactured cigarettes, accounting for nearly 20% of the world's total. Nearly two million people are employed in the manufacture of tobacco products across the world with two thirds being in China, India and Indonesia.

During 2000 to 2001 the contribution of tobacco to the Indian economy was about 12% of the total excise collections. Foreign exchange earnings during the same period were 4% of India's total agricultural exports. Andhra Pradesh, Gujarat, Karnataka, Maharashtra, Bihar and Tamil Nadu are the major tobacco producing states in India. Tobacco is also grown in Orissa, Uttar Pradesh and West Bengal (Reddy and Gupta 2004). Tobacco usage in India is contrary to the world trends since smokeless tobacco and bidi are the dominant forms of consumption (Reddy and Gupta 2004).

The manner in which tobacco is consumed varies in different regions of the world. Manufactured cigarettes consisting of reconstituted tobacco processed with hundreds of chemicals, often with a filter are the predominant form of tobacco used worldwide. Filter-tipped cigarettes are more popular than the non-filter tipped. Bidis consist of a small amount of tobacco, hand wrapped in dried temburni leaf and tied with a string. The amount of tar and carbon monoxide is higher in bidis than in cigarettes. Bidi use is seen throughout South-East Asia and bidis are the most used type of tobacco in India. Kreteks are clove-flavoured cigarettes which contain a wide range of exotic flavouring substances. These

additives have an anaesthetising effect on the respiratory tract. Pipes are made of briar, slate, clay or other substances. Tobacco is placed in the bowl and inhaled through the stem, at times through water as in hookkah. Tobacco is used orally throughout the world; but among women in India, using smokeless tobacco is the predominant habit. Moist snuff is another form of tobacco use. It is taken orally; a small amount of ground tobacco is placed in the mouth between the cheek and the gum. Dry snuff is powdered tobacco that is inhaled through the nose or taken by mouth (Shafey et al. 2009). Tobacco is consumed in a variety of forms in the different states of India. There are no detailed data with sufficient accuracy on the prevalence of the habits, partly because of India's large population which is over one billion, and also because of the variation in the selection of the base population, the design, and the coverage in the studies and the accuracy of recording the habit. Yet the main features of the habits are known, bidis being the popular forms of tobacco use especially in rural areas and in women. The habit of bidi smoking is being substituted more and more by cigarettes. Other known forms of tobacco smoking are listed in table 1. In addition, there are many more forms of smoking, some of them observed only locally within India (Bhonsle et al. 1990)

Smokeless tobacco is widely used in India. The forms include chewing, sucking and products for cleaning the teeth. Pan chewing is the most prevalent form of smokeless tobacco habit. Its main ingredients are betel leaf, tobacco, areca nut, slaked lime and catechu (Acacia catechu). There is written evidence that indicates that the habit is over 2000 years old. In the past, smokeless tobacco products were mainly home made. Today they are increasingly available in plastic and aluminum foil packets. A few other smokeless tobacco products are listed in table 1. Many of them are known only locally. The various forms of smoking tobacco and smokeless tobacco in India are given in table 1. Fig. 1 indicates the different states of India with the specific tobacco forms listed in table 1.

Table 1
Different forms of tobacco use in India (Reddy and Gupta 2004)

Smoked tobacco in India	
Bidis	Bidis are made by rolling a dried, rectangular piece of tendu leaf with 0.15.0.25 g of sundried, flaked tobacco
Cigarettes	Cigarette is a roll of tobacco wrapped in paper. Cigarettes may come with filters, as thins, low-tar, menthol, and flavoured
Cigars	Cigars are made of air-cured, fermented tobacco
Cheroots	A cheroot is a roll made from tobacco leaves
Chuttas	Chuttas are coarsely prepared cheroots. They are usually the products of cottage and small-scale industries, or are made at home. Chutta smoking is widespread in the coastal areas of Andhra Pradesh, Tamil Nadu and Orissa
Reverse smoking	Smoking while keeping the glowing end of the tobacco product inside the mouth
Dhumti	Dhumti is a kind of a conical cigar made by rolling tobacco leaf in the leaf of another plant
Pipe	Pipe smoking is one of the oldest forms of tobacco use. Different kinds of pipes are used for smoking
Hooklis	Clay pipes commonly used in western India. Once the pipe is lit, it is smoked intermittently. On an average, 15 g of tobacco is smoked daily
Chillum	Chillum smoking is an exclusively male practice; it is limited to the northern states of India, predominantly in rural areas. The chillum is a straight, conical pipe made of clay, 10.14 cm long, held vertically. Often, one chillum is shared by a group. They are made locally, are inexpensive and easily available
Hookah	The hookah is an Indian water pipe in which the tobacco smoke passes through water before inhalation
Smokeless tobacco use in India	
Paan (betel quid) with tobacco	Paan consists of four main ingredients. Betel leaf, areca nut (Areca catechu), slaked lime [$Ca(OH_2)$] and catechu (Acacia catechu). Tobacco became an important constituent of paan, and currently most habitual paan chewers include tobacco in the quid
Paan masala	Paan masala is a commercial preparation containing areca nut, slaked lime, catechu and condiments, with or without powdered tobacco.
Mainpuri tobacco	In the Mainpuri district of Uttar Pradesh andnearby areas, this preparation is very popular. It contains mainly tobacco with slaked lime, finely cut areca nut
Mawa	This preparation contains thin shavings of areca nut with the addition of some tobacco and slaked lime. Its use is becoming popular in Gujarat, especially among the youth
Khaini	Use of a mixture of sun-dried tobacco and slaked lime is widespread in Maharashtra and several states of north India. A regular khaini user may

	carry a double-ended metal container, one side of which is filled with tobacco and the other with slightly moistened slaked lime. A small quantity of tobacco is taken in the palm and a little slaked lime is added. The ingredients are then mixed vigorously with the thumb and placed in the mouth. In the Singhbhum District of Bihar, the user often keeps this product on the dorsum of the tongue
Chewing tobacco	Small pieces of raw or commercially available finely cut tobacco are used for this purpose
Snus	Swedish snuff called snus is available in tea bag like pouches. The pouch can be kept in the buccal or labial groove and sucked
Mishri	Mishri is a roasted, powdered preparation made by baking tobacco on a hot metal plate until it is uniformly black. In the past it was used to clean the teeth. This practice is common in Maharashtra
Bajjar	Bajjar is dry snuff (also known as tapkeer) applied commonly by women in Gujarat on the teeth and gums
Gudhaku	Gudhaku is a paste made of tobacco and molasses. It is commonly used in Bihar, Orissa, Uttar Pradesh and Uttaranchal. Gudhaku is applied to the teeth and gums, predominantly by women

The basic requirement for the control of tobacco use is to provide information and enhance the knowledge, attitude and motivation through health education activities, seminars or distribution of leaflets, pamphlets, etc. Also it is necessary to provide support to those who wish to quit the habit. Studies in Kerala, India showed that women can play a vital role in the prevention of smoking tobacco use (Sreedharan et al. 2010, Muttappallymyalil et al. 2010(b)). It is important to know the factors which are associated with the habit of tobacco use to control the tobacco prevalence in any country, which may different from to another. Use of tobacco as well as the determinants varies in different parts of the world. In this context, the current study is significant, as it determines the prevalence and determinants of tobacco use in Kerala, India.

Fig. 1

Map of India showing States

2. REVIEW OF LITERATURE

2.1 Prevalence of tobacco use in India

The major forms of tobacco consumption in India are cigarette and bidi smoking and tobacco chewing. Unlike in the developed countries, tobacco smoking in India is mostly bidi use (Gupta et al. 1984). Traditionally, chewing betel quid with tobacco was common among the Kerala population irrespective of social class and caste. Betel leaf chewing was a custom among the upper caste Hindus of Kerala. Initially betel leaves and pieces of areca nut were the major ingredients of this quid and tobacco was added subsequently. This practice was believed to remove bad breath and its hazard on health. Studies from India showed a high prevalence of tobacco smoking habit among men compared to women. (Thankappan 2007, Chaturvedi et al. 1998, Bala et al. 2006, Daniel et al. 2008).

A study among school children in Kerala showed that the use of any form of tobacco substance currently was 11%. The proportion of school students who had experimented with some form of tobacco was 35%, among whom 24% had experimented smoking and 11% smokeless tobacco. The prevalence of current smoking was 8.1% and the use of smokeless tobacco was 3.2% according to Mohan et al. (Mohan et al. 2005). A study among school students in Goa, India showed that the ever tobacco users was 13.5% with that among boys being 14.9% and among girls 10.9%. The study also reported that current tobacco use was 5.5% among boys and 3.2% among girls while smoking tobacco was 3.5% among boys and 2.2% among girls. Smokeless tobacco use was 3.3% and 2.1% respectively among boys and girls (Pednekar and Gupta 2004). A study among male college students of Karnataka state in India revealed that 36% experienced (tried tobacco product on five or fewer occasions in their lifetime) cigarette smoking, 10% experienced bidi smoking and 6% experienced pan with tobacco chewing (Nichter et al. 2004). A study in Kerala showed that the prevalence of smokeless tobacco use among adolescent male students was 2%. The researchers also observed that the habit of smokeless tobacco use started at the adolescent age (Muttapppallymyalil et al. 2010a). The Youth Tobacco Surveillance study reported that 68% of boys and 48% of girls had their first experience of tobacco before the age of 10 years. The use of tobacco products was 57% among boys and 41% among girls, with high rates of oral tobacco use approximating 37% in India (Gupta 2002).

A study conducted in Kolkata, India showed that about 38.3% of adult men were smokers and 35.7% were tobacco chewers. Among women, the smoking habit was prevalent only among 0.5%, but 18.7% of women were tobacco chewers. The study also revealed that 52% of smokers used cigarettes and 35% bidis for smoking (Sen 2002). A Study in Gujarat, India showed that the tobacco habit was more popular than alcohol and panmasala use. The prevalence of tobacco use in any form was 47.6% in the total population (Bala et al. 2006). A study from India reported that the overall prevalence rates among men varied from 61% in Maharashtra to 86% in Andhra Pradesh and among women it ranged from 15% in Gujarat to 67% in Andhra Pradesh (Bhonsl et al. 1990). A study from rural Bihar showed that tobacco use was 78% in men and 52% among women and that the smoking pattern was largely the use of bidi (Sinha et al. 2003). In Karnataka among those who were above the age of 15 years, the prevalence of tobacco use was 19.6% among men and 15.7% among women. Smokeless tobacco use was higher compared to smoking tobacco, the prevalence being 10.5%. (Daniel et al. 2008). A study among those above the age of 10 years in Mizoram showed that among males the prevalence of smoking tobacco was 42.3% and smokeless tobacco habit was 15.9%. Among women, the chewing habit was more frequent than smoking tobacco: 27.9% compared to 16.1% (Chaturvedi et al. 1998).

It appears that tobacco use is more prevalent among college students in Nepal than in the other South Asian countries. The overall prevalence of tobacco use observed is 13.9%: 20.5% among boys and 2.9% among girls. Among the current users, cigarette smoking was 9.4%, smokeless tobacco use was 6.5%, and both forms was 5.7% (Sreeramareddy et al. 2008). A study in Rawalpindi, Pakistan among men and women between the ages of 18 to 65 years showed that 16.5% of the population used tobacco with 33% men and 4.7% women using tobacco on a daily basis. It was also observed that among tobacco users, 68.5% were cigarette smokers, 13.5% were oral tobacco users, 12% were hookha users and 6% used combinations of these types of tobacco (Alam et al. 2008). In Iran it was observed that the prevalence of cigarette smoking was 11.9% (Fotouhi et al. 2009). A study in Kuwait with those aged above 17 years showed an overall prevalence of tobacco use of 17%. The prevalence was significantly higher among men than among women. Smoking prevalence was 34.4% among men and 1.9% among women (Memon et al. 2000). A study in Malaysia observed a high prevalence of tobacco chewing among women. The habit was common among those whose level of education was low (Gan 1995).

The tobacco atlas published by WHO reported that the highest prevalence of tobacco use (54.0%) was in Nauru and the lowest (5.5%) in Rwanda. Among men the highest prevalence was reported from Mongolia (67.8%) and the lowest from Rwanda (7%). Among women the highest prevalence rate was reported from

Nauru (47.0%) and the lowest from UAE (<1%). The annual cigarette consumption 4313 per person was the highest in Greece and the lowest, 77 per person in Sudan (Mackay and Eriken 2002). The prevalence of tobacco smoking habit among men exceeds 50% in many parts of the developing world. In the developed countries approximately 22% of women and in the developing countries 9% of women smoke tobacco (Mackay and Eriken 2002). Estimates based on World Health Organization data show that there are currently 1.1 billion tobacco smokers worldwide, representing one-third of the entire population aged 15 years and above. Moreover, 800 million of these smokers live in the developing countries (WHO 1997).

India has a multitude of tobacco habits. There are probably large variations in the habit in different parts of the subcontinent. This variation is not well known and the data from the present study may show differences which may suggest insufficiency of data rather than true variations in tobacco use. The socio-demographic risk factors of tobacco use seem to affect the prevalence of tobacco use consistently, with an inverse relationship associated with same. This data from India is neither consistent and seems to follow either the Western pattern or pattern typical for a developing country depending on the results of empirical studies. The prevalence of smoking and smokeless tobacco use in different parts of India is given in table 2 and table 3 respectively.

Table 2
Prevalence of Smoking tobacco use in different States in India

Author and Year	Region	State	Population	Year	Male	Female	Total
Bhawna G 2013	North	Jammu & Kashmir	>15 years	2009-10	30.7	6.2	--
Bhawna G 2013	North	Himachal Pradesh	>15 years	2009-10	30.1	3.1	--
Bhawna G 2013	North	Haryana	>15 years	2009-10	28.7	4.3	--
Garg et al.2012	North	New Delhi	>=30 years	2007- 08	24.6	8.8	--
Bhawna 2013	North	New Delhi	>15 years	2009-10	24.1	0.9	
Reddy et al.2006	North & South	Delhi & Chennai	6^{th} grade	2006	--	--	4.0
Reddy et al.2006	North & South	Delhi & Chennai	8^{th} grade	2006	--	--	1.8
Reddy et al.2006	North & South	Delhi & Chennai	10-16 years	2006	--	--	3.0
Bhawna 2013	North	Rajasthan	>15 years	2009-10	21.8	4.5	--
Bhawna 2013	North	Chandigarh	>15 years	2009-10	15.2	0.6	--
Bhawna 2013	North	Punjab	>15 years	2009-10	9.4	0.4	--
Bhawna 2013	North-East	Meghalaya	>15 years	2009-10	52.6	0.7	--
Chaturvedi et al. 1998	North-East	Mizoram	>=10 years	1998	42.3	16.6	--
Bhawna 2013	North-East	Mizoram	>15 years	2009-10	39.9	12.5	--
Bhawna 2013	North-East	Tripura	>15 years	2009-10	24.0	4.6	--
Bhawna 2013	North-East	Arunachal Pradesh	>15 years	2009-10	19.1	4.0	--
Bhawna 2013	North-East	Nagaland	>15 years	2009-10	16.1	6.4	--
Bhawna 2013	North-East	Manipur	>15 years	2009-10	14.5	4.8	--
Bhawna 2013	North-East	Assam	>15 years	2009-10	12.8	0.1	--
Bhawna 2013	North Central	Madhya Pradesh	>15 years	2009-10	58.5	0.5	--
Bhawna 2013	North Central	Uttarakhand	>15 years	2009-10	27.3	3.8	--
Narain et al. 2011	North Central	Uttar Pradesh	11-19 years	2005	--	--	3.1
Bhawna 2013	North Central	Uttar Pradesh	>15 years	2009-10	13.4	3.3	--

Table 2 continued
Prevalence of Smoking tobacco use in different States in India

Author and Year	Region	State	Population	Year	Male	Female	Total
Bhawna 2013	North Central	Bihar	>15 years	2009-10	4.1	5.4	--
Sen 2002	East	West Bengal	Adult men	2000	38.3	0.5	--
Bhawna 2013	East	West Bengal	>15 years	2009-10	26.6	1.5	--
Bhawna 2013	East	Sikkim	>15 years	2009-10	21.1	9.9	--
Bhawna 2013	East	Chhattisgarh	>15 years	2009-10	11.4	--	--
Bhawna 2013	East	Odisha	>15 years	2009-10	5.4	0.7	--
Bhawna 2013	East	Jharkhand	>15 years	2009-10	3.7	0.5	--
Bhawna 2013	West	Gujarat	>15 years	2009-10	14.8	0.3	--
Pednekar et al. 2004	West	Goa	<15 years	2004	3.5	2.2	--
Bhawna 2013	West	Goa	>15 years	2009-10	7.1	0.9	--
Bhawna 2013	West	Maharashtra	>15 years	2009-10	7.1	--	--
Bhawna 2013	South	Andhra Pradesh	>15 years	2009-10	24.0	4.3	--
Mohan et al. 2005	South	Kerala	12-19 years	2003	8.1	--	--
Bhawna 2013	South	Kerala	>15 years	2009-10	22.4	--	--
Bhawna 2013	South	Puducherry	>15 years	2009-10	17.7	--	--
Bhawna 2013	South	Karnataka	>15 years	2009-10	17.2	0.2	--
Kaur et al.2011	South	Tamil Nadu	25-64 years	2011	37.6	15.1	--
Bhawna 2013	South	Tamil Nadu	>15 years	2009-10	16.3	--	--

Table 3
Prevalence of Smokeless tobacco use in different States in India

Author and Year	Region	State	Population	Year	Male	Female	Total
Rooban et al. 2010	North	Jammu & Kashmir	>15 years	2005-06	9.7	--	--
Bhawna 2013	North	Jammu & Kashmir	>15 years	2009-10	6.7	2.5	--
Rooban et al. 2010	North	Himachal Pradesh	>15 years	2005-06	10.3	--	--
Bhawna 2013	North	Himachal Pradesh	>15 years	2009-10	5.2	0.6	--
Rooban et al. 2010	North	Haryana	>15 years	2005-06	7.2	--	--
Bhawna 2013	North	Haryana	>15 years	2009-10	6.7	1.1	--
Reddy et al.2006	North & South	Delhi & Chennai	10-16 years	2006	--	--	3.0
Reddy et al.2006	North & South	Delhi & Chennai	6^{th} grade	2006	--	--	4.5
Reddy et al.2006	North & South	Delhi & Chennai	8^{th} grade	2006	--	--	1.6
Rooban et al. 2010	North	New Delhi	>15 years	2005-06	24.0	--	--
Bhawna 2013	North	New Delhi	>15 years	2009-10	10.4	2.6	--
Rooban et al. 2010	North	Rajasthan	>15 years	2005-06	31.9	--	--
Bhawna 2013	North	Rajasthan	>15 years	2009-10	19.0	7.6	--
Bhawna 2013	North	Chandigarh	>15 years	2009-10	5.0	1.1	--
Rooban et al. 2010	North	Punjab	>15 years	2005-06	17.4	--	--
Bhawna 2013	North	Punjab	>15 years	2009-10	8.9	0.2	--
Rooban et al. 2010	North East	Meghalaya	>15 years	2005-06	39.6	--	--
Bhawna 2013	North-East	Meghalaya	>15 years	2009-10	6.2	33.1	--
Chaturvedi et al. 1998	North East	Mizoram	>=10 years	1998	15.9	27.9	--
Rooban et al. 2010	North East	Mizoram	>15 years	2005-06	38.6	--	--
Bhawna 2013	North-East	Mizoram	>15 years	2009-10	13.1	42.6	--
Rooban et al. 2010	North East	Tripura	>15 years	2005-06	45.9	--	--
Bhawna 2013	North-East	Tripura	>15 years	2009-10	19.8	37.7	--
Rooban et al. 2010	North East	Arunachal Pradesh	>15 years	2005-06	52.0	--	--

Table 3 continued
Prevalence of Smokeless tobacco use in different States in India

Bhawna 2013	North-East	Arunachal Pradesh	>15 years	2009-10	16.1	20.5	--
Rooban et al. 2010	North East	Nagaland	>15 years	2005-06	54.9	--	--
Bhawna 2013	North-East	Nagaland	>15 years	2009-10	20.5	30.6	--
Rooban et al. 2010	North East	Manipur	>15 years	2005-06	56.8	--	--
Bhawna 2013	North-East	Manipur	>15 years	2009-10	26.4	30.4	--
Rooban et al. 2010	North East	Assam	>15 years	2005-06	57.0	--	--
Bhawna 2013	North-East	Assam	>15 years	2009-10	26.6	23.1	--
Rooban et al. 2010	North central	Madhya Pradesh	>15 years	2005-06	45.6	--	--
Bhawna 2013	North Central	Madhya Pradesh	>15 years	2009-10	28	16.7	--
Bhawna 2013	North Central	Uttarakhand	>15 years	2009-10	12.2	1.9	--
Rooban et al. 2010	North central	Uttar Pradesh	>15 years	2005-06	41.0	--	--
Bhawna 2013	North Central	Uttar Pradesh	>15 years	2009-10	24.9	12.4	--
Rooban et al. 2010	North central	Bihar	>15 years	2005-06	57.7	--	--
Bhawna 2013	North Central	Bihar	>15 years	2009-10	45.9	32.3	--
Sen 2002	East	West Bengal	Adult men	2000	35.7	18.7	--
Rooban et al. 2010	East	West Bengal	>15 years	2005-06	34.2	--	--
Bhawna 2013	East	West Bengal	>15 years	2009-10	12.8	17.3	--
Rooban et al. 2010	East	Sikkim	>15 years	2005-06	38.6	--	--
Bhawna 2013	East	Sikkim	>15 years	2009-10	13.4	17.3	--
Rooban et al. 2010	East	Chhattisgarh	>15 years	2005-06	49.1	--	--
Bhawna 2013	East	Chhattisgarh	>15 years	2009-10	43.0	37.9	--
Rooban et al. 2010	East	Odisha	>15 years	2005-06	57	--	--
Bhawna 2013	East	Odisha	>15 years	2009-10	36.3	35.5	--
Rooban et al. 2010	East	Jharkhand	>15 years	2005-06	52.5	--	--

Table 3 continued
Prevalence of Smokeless tobacco use in different States in India

Bhawna 2013	East	Jharkhand	>15 years	2009-10	45.8	34.9	--
Rooban et al. 2010	West	Gujarat	>15 years	2005-06	42.9	--	--
Bhawna 2013	West	Gujarat	>15 years	2009-10	26.4	9.9	--
Pednekar et al. 2004	West	Goa	<15 years	2004	3.3	2.1	--
Rooban et al. 2010	West	Goa	>15 years	2005-06	15.4	--	--
Bhawna 2013	West	Goa	>15 years	2009-10	4.7	3.2	--
Rooban et al. 2010	West	Maharashtra	>15 years	2005-06	38.1	--	--
Bhawna 2013	West	Maharashtra	>15 years	2009-10	30.0	18.8	--
Rooban et al. 2010	South	Andhra Pradesh	>15 years	2005-06	16.0	--	--
Bhawna 2013	South	Andhra Pradesh	>15 years	2009-10	10.4	13.1	--
Mohan et al. 2005	South	Kerala	12-19 years	2003	3.2	--	--
Rooban et al. 2010	South	Kerala	>15 years	2005-06	14.9	--	--
Jayakumary et al.2010	South	Kerala	10-15 years	2009	2.0	--	--
Bhawna 2013	South	Kerala	>15 years	2009-10	7.6	8.5	--
Bhawna 2013	South	Puducherry	>15 years	2009-10	3.3	6.3	--
Rooban et al. 2010	South	Karnataka	>15 years	2005-06	21.3	--	--
Bhawna 2013	South	Karnataka	>15 years	2009-10	16.6	16.0	--
Kaur et al.2011	South	Tamil Nadu	25-64 years	2011	--	15.1	--
Rooban et al. 2010	South	Tamil Nadu	>15 years	2005-06	15.2	--	--
Bhawna 2013	South	Tamil Nadu	>15 years	2009-10	4.9	8.3	--

2.2 Health consequences of tobacco

Tobacco use continues to be the leading cause of preventable death worldwide (WHO 2005). Several studies worldwide have documented that tobacco use, both smoked and smokeless, is associated with general and oral health. Studies have reported that increased dental caries rate among young, adult and elderly tobacco smokers (Al-Habashneh et al. 2009, Rooban et al. 2011, Tanaka et al. 2010).

2.2.1 Health consequences of smoked tobacco

Smoking tobacco alone will cause around 930,000 adult deaths in India by 2010 (Jha et al. 2008). Tobacco use is related to a large number of diseases, including many types of cancers (Lip, Tongue, Mouth, Oropharynx, Nasopharynx, Hypopharynx, Pharynx, Oesophagus, Larynx, Lung, Stomach, Kidney, Bladder, Cervix), chronic obstructive pulmonary disease (COPD), coronary heart disease, peripheral vascular disease, hypertension, pneumonia, stroke and peptic ulcer (Shinton et al. 1989, Sankaranarayanan et al. 1998, Parrish et al. 1993, Castellsague et al. 1999, Yuan et al. 1998, Boffetta et al. 1993). Cancer of lung, bladder, pancreas and upper respiratory sites, ischaemic heart disease and chronic obstructive lung disease are largely related to tobacco smoking. Moreover cancer of oesophagus, stomach, kidney, leukemia, stroke and pneumonia are partly related to tobacco smoke (Doll et al. 1994). Peto et al. reported that tobacco use affected more men than women, but the habit has spread to the females in the developed countries (Peto et al. 1994). It is also reported that the cessation of smoking may decrease the epidemic of lung cancer deaths in the next few decades (Peto et al. 2000). A study in Britain on male doctors revealed that many diseases are entirely or partially related to tobacco use (Doll et al. 1994).

In another study in Finland it was observed that smokers experienced nearly three years of loss in their life expectancy compared to the non-smokers. The study additionally showed the loss of 2.6 years of potential working time experienced by smokers compared to the non-smokers (Kiiskinen et al. 2002). According to Anderson the cumulative effects related to the duration of smoking may be more important than the number of cigarettes smoked with regard to tuberculin skin test conversion (Anderson et al. 1997). A Spanish case-control study revealed that there was a dose response relationship between the number of cigarettes smoked daily and the risk of active pulmonary TB. This study showed that the OR for active smokers was 3.8 and for passive smokers 2.5, although the findings were not

statistically significant (Alcaide et al. 1996). A study in the US revealed that those who had smoked for 20 years or more had 2.6 times the risk of having TB than the non-smokers (Buskin et al. 1994). Doll reported that the ratio of death rates for TB among smokers was 2.8 compared to non-smokers (Doll 1999). In a study in China it was reported that of all deaths attributed to tobacco, 45% were due to chronic obstructive disease and 15% to lung cancer, 5-8% each to esophageal cancer, stomach cancer, liver cancer, TB, stroke and IHD (Liu et al. 1998). Another study showed that acute exposure to cigarette smoke increased airway resistance and pulmonary epithelial permeability. Cigarette smoke affects the macrophage, decreases responsiveness to antigen, increases synthesis of elastase and decreases production of antiproteases (Bor and Epstein 1991). A cohort study in the United States revealed that current smokers are at an increased risk of dying from prostate cancer (Watters et al. 2009).

Lee et al. reported a statistically significant association between tobacco use and cancers of various sites like oral cavity, oropharynx, oesophagus, stomach, pancreas, lungs (Lee et al. 2011). Results from a study by Sapkota et al. suggest bidi and cigarette smoking are a risk factor for cancer of the hypopharynx, supraglottis and glottis. The OR for cancer of hypopharynx and bidi smoking was 6.8 and 3.8 for cigarette smoking. With regard to cancer of supraglottis the OR observed was 7.5 and 2.1 respectively for bidi and cigarette smoking and for cancer of the glottis the OR was 5.3 and 5.7 respectively (Sapkota et al. 2007). Znaor et al. reported that the most important risk factor for developing pharyngeal and laryngeal cancers is tobacco use (Znaor et al. 2003). Ojima et al. reported that current smokers are more likely to develop caries than non-smokers (Ojima et al. 2013). Tobacco use is a modifiable risk factor for various oral diseases, especially the cancers of oral cavity and pharynx (Bunnell et al. 2010, Khanna et al. 2012).

Tobacco smoking has been identified as one of the risk factors for developing COPD. Studies have reported a dose-response relationship with tobacco use and COPD (Xu et al. 2007, Halbert et al. 2003, Fang et al. 2011). Smoking cessation reduces the chance of subsequent incidence of MI among those affected with COPD (Alvarez et al. 2011, Panagiotakos et al. 2004). Current smoking in patients with advanced atherosclerosis is associated with endothelial damage. The plasma ADMA levels, PAI-1 and TM levels were lower in non-smokers compared with current smokers (Szpak et al. 2013)

Migraine is associated with tobacco use irrespective of the type of use (Aamodt et al. 2006, Fernandez-de-Las-Penas et al. 2010, Sarker et al. 2013). Smoking appears to influence the mental health of a person generally. There is also some pathophysiological pathway which can cause depression. Studies have reported that tobacco smoking is a risk factor for depression (Berk et al. 2008, Nunes et al. 2012, Vanable et al. 2003). Among women who smoke, the risk for developing

depression observed was two times more as compared to non-smokers (Pasco et al. 2008). Stafford et al. observed that there is an independent harmful effect of smoking on health-related quality of life among patients with heart disease. Among the smokers health-related quality of life was poor compared to non-smokers. (Stafford et al. 2013)

A study in Mumbai revealed that the risk ratio for cancer is very high in tobacco users compared to that in the non-users (Jussawalla et al. 1971). A cohort study conducted in Mumbai showed that among men, obese tobacco smokers were at 56% increased risks of death compared to the overweight never users of tobacco (Pednekar et al. 2008). Cancers of the upper alimentary and respiratory tracts constitute about 50% of all cancers among Indian men (Gangadharan et al. 2001). Men smoking in excess of 20 bidis per day were 3.2 times more likely to get gingival cancer compared to non-users (Sankaranarayanan et al. 1989). A study by Gupta et al. showed that bidi smoking is as harmful as cigarette smoking and that bidi smoking in low intensity also is a risk for mortality due to all causes. The relative risk for all cause mortality among bidi smokers was 64% higher than that in cigarette smokers and 37% higher than in non-users of tobacco. The study also showed that deaths due to respiratory diseases, TB, and neoplasms were more than double among male smokers as compared to non-tobacco users (Gupta et al. 2005).

It was reported in a study in Kerala that tobacco smoking is a cause for oesophagus cancer (Sankaranarayanan et al. 1991). Those who smoked bidi for 20 years had seven times more risk of getting cancer of the larynx and those who smoked cigarettes for the same duration had five times higher risk than non-smokers (Sankaranarayanan 1990). A cohort study from Kerala revealed that the incidence of lung cancer is strongly related to the number of bidis smoked per day, the duration of smoking, and the age of starting the bidi smoking habit (Jayalekshmi et al. 2008). It was also observed in the study that there was an association between bidi smoking and cancers of the gum and mouth. (Jayalekshmi et al. 2011).

2.2.2 Health consequences of smokeless tobacco

A study conducted in 1955 in India showed that tobacco chewing was associated with cancer of the oral cavity, smoking was associated with cancer of the oropharynyx and oesophagus and the combined habit of smoking and smokeless tobacco was associated with cancer of the hypopharynx and base of the tongue (Sanghvi et al. 1955). The high incidence of oral cancer in India is linked to the high prevalence of betel quid chewing and tobacco use (Gupta et al. 1984). A study by Gupta et al. showed that the relative risk for all cause mortality due to smokeless tobacco was 37% higher among women (Gupta et al. 2005). A meta analysis also showed that there was an association between smokeless tobacco use and myocardial infarction and stroke (Boffetta 2009). A study in India observed a dose-response relationship between frequency of chewing and risk of cancer of hypopharynx (Sapkota et al. 2007).

The Mumbai cohort study revealed that smokeless tobacco use was associated with cancers of the lip, oral cavity and pharynx, and digestive, respiratory, and intrathoracic organs (Pednekar 2011). Gajalakshmi et al. reported that the habit of ever chewing tobacco was positively associated with stomach cancer mortality with an OR of 1.8. With regard to cervical cancer mortality, the OR was 2.0. But the study did not observe any relationship with chewing tobacco and breast cancer (Gajalakshmi et al. 2012). Gupta et al. reported that chewing tobacco use is associated with low birth weight and low gestational age (Gupta et al. 2004).

A case control study in Kerala showed that individuals chewing tobacco ten or more times a day were 15 times more likely to get gingival cancer compared to non-chewers. Men who used snuff were 3.9 times more likely to get gingival cancer compared to non-users (Sankaranarayanan et al. 1989). A cohort study in Kerala concluded that tobacco chewing is a risk for oral cancer (Jayalekshmi et al. 2011). In a cohort study in Kerala it was observed that tobacco chewing increased the risk of cancers of the gum and mouth. The study showed a RR of 4.7 for tobacco chewers in developing gum and mouth cancer. It is also reported that the risk increased with higher frequency of intake and longer duration of smokeless tobacco consumption (Jayalekshmi et al. 2011).

2.2.3 Global health effects of tobacco use

It is estimated that tobacco kills four million people worldwide every year (Murray & Lopez 1997). According to the World Bank, the total deaths due to tobacco use in 2000 was 3,659,000 and 768,000 in South Asia (World Bank 1999). A study in

Tamil Nadu, India by Gajalakshmi et al. revealed that 50% of smokers died due to the consequences of the habit of smoking. In 2000, 700,000 deaths in India were caused by smoking, and it is estimated that the death will double between 2000 and 2025 (Gajalakshmi et al. 2003).

2.3 Factors leading to tobacco use

The health consequences of tobacco use are serious; therefore identifying the factors that lead to tobacco use are important in improving the health and preventing deaths. The reasons behind the different forms of tobacco use vary in the developed and the developing countries and with respect to demographic and individual characteristics. Smoking is more prevalent in the developed countries than in the developing countries and smokeless tobacco use is more common in the developing countries than in the former.

2.3.1 Demographic factors

Studies have shown that socio-economic status, age, and gender are significant factors in overall tobacco use (Horn et al. 2000, Gilmore et al. 2001, Bandason et al. 2010). Among men the lack of skills, the lack of education, poor economic status, and acceptance by the society were the socio-economic factors associated with an increase in tobacco use. The habit was high among the young, low-skilled, unemployed women living in cities. The marital status was shown to be of borderline significance in the use of tobacco (Gilmore et al. 2001). Female gender is reported to be one of the factors which favour the absence of tobacco habit (Hallal et al. 2009, Khader et al. 2008, Rachiotis et al. 2008). A study in the United States showed that smokeless tobacco users were mostly in the age group of 25-44 years. Additionally, the smokeless tobacco users were found to have a lower educational status. The study also revealed that dual users were aged 18-24 years and there was no other significant difference among dual users and former smokers with respect to demographic and social characteristics (Rodu and Cole 2009).

The increase in the population in the third world is a reason for the increasing prevalence of tobacco use (Weng et al. 1990). The risk factors do not have the same effects as in the developed countries. Among rural male residents in China it was observed that age, marital status, ethnicity, education, occupation, and income were significant factors associated with an increased likelihood of smoking (Yang et al. 2008). Also in another study in Saudi Arabia it was found that there was a strong association between smoking and gender, marital status and education. The odds

of smoking among men were 27 times those among women (Jarallah et al. 1999). A study in Iran showed that married people smoked significantly more than those who were single (Fotouhi et al. 2009). A study with Kuwaiti adults revealed that the factors associated with the habit of tobacco were age, years of education, type of occupation and marital status (Memon et al. 2000).

The tobacco habits in India sometimes follow the patterns of the Western world, and at other times those of the developing countries. A study conducted in Delhi showed that women who professed Islam and Christianity had higher odds of being smokers than Hindu women, and skilled and unskilled workers had higher odds than professionals (Narayan et al. 1996). A study in Karnataka showed that increasing age and years of schooling are two important factors associated with the use of tobacco (Daniel et al. 2008). Another study among children revealed that the demographic factors associated with tobacco habits were being of older age, being men and of being in high socio-economic status (SES). Students who had high SES were more likely to be ever users of tobacco (Sreeramareddy et al. 2008). In a cross-sectional study in India it was observed that subjects with low literacy and agriculture and labour occupational groups had a significantly higher prevalence of smoking. Smoking was also significantly associated with increase of age, and there was an inverse relationship between smoking and increasing levels of education. Smokeless tobacco use was observed to have a direct and positive association with education but negative association with age (Bala et al. 2006).

2.3.2 Individual determinants

The factors significant in overall tobacco use included attitude towards tobacco use and knowledge about the association between tobacco use and health. A study in the US revealed that the factors significant in attributing to smoking were smoking among friends and siblings, favourable attitude towards tobacco use, and family problems. The significant determinants for smokeless tobacco use included the presence of the habit among siblings, use among close friends and favourable attitude towards tobacco use (Horn et al. 2000). Among school children in New York, smoking in the family and the availability of cigarettes were the two most important risk factors (Nichols et al. 2006). In a study in Brazil, the risk factors associated with smoking among schoolchildren were identified as a smoking father, smoking friends, advertisements on posters and the exposure to second hand tobacco smoke (Hallal et al. 2009). A study in Jordan among university students showed that the factors associated with tobacco smoking were lower academic attainment, high income and many friends and family members using tobacco products (Khader et al. 2008). A study that was conducted in Iran to identify

correlates of cigarette smoking, it was observed that a high association existed between the use of cigarettes among close friends and alcohol use and male gender. Low use of tobacco was observed among those who observed religious practices and had good academic performances (Nakhaee et al. 2011). A study among the secondary school children in Zimbabwe revealed that smoking by friends and parent were the significant factors for being a smoker (Bandason et al. 2010). Chassin et al. reported that some of the primary determinants or risk factors for tobacco use included favourable attitude towards tobacco use, inadequate knowledge about tobacco and ill health, tobacco use among family, tobacco use by friends, family problems and problems in the school (Chassin et al. 1985). Both smoking and smokeless tobacco use are associated with other risk behaviours during adolescence. Adolescent smoking was also associated with alcohol and illicit drug use (McDermott et al. 1996).

It appears consistently in different parts of the world that the tobacco use of friends and family members is the strongest risk factor of the individual's tobacco use. In India, a study in Kerala among school children showed that the factors which favoured the habit of tobacco use were the availability of pocket money, low academic performances and the use of tobacco by friends. The prevalence was four times higher among the students who received pocket money, three times higher among those with low academic performance and three times higher among those whose friends used tobacco (Mohan et al. 2005).

2.4 WHO Framework Convention on Tobacco Control

Framework Convention on Tobacco Control (FCTC) was initiated to "promote multilateral cooperation and national action to reduce the growth and spread of the global tobacco epidemic". In 1996 World Health Assembly adopted the resolution for the development of a WHO framework convention on tobacco control. The American Public Health association and other non-governmental agencies strongly supported the convention for initiating effective action for tobacco control (Roemeer et al. 2005). The 52nd World Health Assembly in 1999 called for work on the WHO FCTC to begin, and the outcome was finally endorsed by the 56th World Health Assembly in 2003. The treaty came into force in 2005. FCTC is the first treaty adopted under the sponsorship of WHO. The aim of this treaty was to promote multilateral cooperation and action to reduce the spread of the global tobacco epidemic (Roemeer et al. 2005).

India is a major partner in tobacco control activities and has played a leadership role to bring the challenge posed by tobacco to the forefront. India is the 7th country that implemented WHO's FCTC. The framework also strives to "protect

present and future generations from the devastating health, social, environmental, and economic consequences of tobacco consumption and exposure to tobacco smoke." Over the past 30 years, India has adopted a series of bills, but they could reduce the use of tobacco only to a limited extent. However, after the implementation of FCTC the progress on tobacco control was commendable (Schwartz et al. 2011). Additionally, India has taken many measures for the control of tobacco, among which is the implementation of the National Tobacco Control Programme. The anti tobacco law in India is strong, complying with most of the provisions in the WHO FCTC (Kaur et al. 2011).

3. AIMS AND OBJECTIVES

Tobacco use is a major, if not the most important, public health problem globally. Any low- or medium-resource country is ill prepared to control the tobacco epidemic. The first pre-requisite to control tobacco use is to ascertain the magnitude and the determinants of the problem. The objective of this investigation is to estimate the prevalence of different forms of tobacco use and identify the determinants of the prevalence in Kerala state in Southern India.

The specific aims were

1. To assess the prevalence of different tobacco habits such as cigarette smoking, bidi smoking and smokeless tobacco use in an Indian rural population of Kerala-Karunagappally taluk of Kollam district.

2. To assess the possible association of gender, age, religion, marital status, education, occupation and income as demographic determinants of tobacco habits in rural Kerala.

3. To assess the association between alcohol consumption and tobacco use in rural Kerala.

4. To evaluate the importance of the determinants of tobacco use at the population level in order to identify the important areas that may be used in instituting preventive action.

4. MATERIALS AND METHODS

4.1. Study Area

Kerala is one of the smaller states in the Indian Union with an area of 38,863 Sq. km which is only 1.3% of the total area of India. It is a 560km long narrow stretch of land, comprising the narrow coastal strip bounded by the Western Ghats in the East and the Arabian Sea on the West. At its widest, Kerala is only 120km from the sea to the mountains. The land is enchanting with tropical forests, fertile plains, beautiful beaches, cliffs, rocky coasts and backwaters.

4.1.1 Description of Kerala state

Kerala has developed into a hundred percent literate society, with world class healthcare indices and India's lowest infant mortality and the highest life expectancy rates compared to the other states. Kerala has achieved significant progress in various fields, which is reflected in the high levels of education and the health of its population. The health indices such as crude death rate (CDR), infant mortality rate (IMR), maternal mortality rate (MMR), total fertility rate (TFR), life expectancy at birth in Kerala are comparable to those in many of the developed countries.

The administrative units in the Kerala state are 14 districts, 63 taluks and 977 panchayats. As per the 2011 census, on 1st March 2011, Kerala had a population of 33,387,677 comprising 16,021,290 males and 17,366,387 females. The sex ratio observed is 1084 females to 1000 males. The literacy rate according to the 2001 census was 96.02% for males and 91.98% for females. Kerala is one of the densely populated states in the country and it recorded a decadal population growth of only 4.86%. The population density of the state is about 859 people per square Kilometres (Census of India 2011).

4.1.2 Description of Karunagappally Taluk

Kollam town is situated 71km north of the state capital Thiruvananthapuram. The district covers an area of 2,492 km^2 and ranks seventh in the State with respect to area. The district is bounded on the North by Alappuzha District, North East by

the Pathanamthitta District, East by Tirunelveli District of Tamil Nadu, South by Thiruvananthapuram District and on the West by the Arabian Sea. The town is famous for cashew and coir processing. It is the southern gateway to the backwaters of Kerala. Kollam district has five taluks, namely: Karunagappally, Kunnathur, Pathanapuram, Kottarakara and Kollam. According to the 2011 census, the total population of the district was 2,629,703, which comprised 1,244,815 males and 1,384,888 females. The population density in the district has increased from 1037 persons per sq. km in 2001 to 1056 persons per sq. km in 2011.

Karunagappally taluk is 90km North from Thiruvananthapuram, the capital city of Kerala. The taluk has a 25km long coastline on the West side and consists of 12 panchayats which are Karunagappally, Thodiyoor, Panmana, Aalappad, Chavara, Neendakara, Thevalakkara, Thekkumbagom, Kulasekharapuram, Thazhava, Clappana and Oachira spread over 192 sq.km. In this taluk, the coastal belt is about half a kilometer wide and is thickly populated, the majority of the inhabitants being fishermen.

The geographical characteristics show that the locality is lowland with backwaters and coastal lines. Agriculture, mat making, coir making, cashew nut processing and fishing are the common occupations of the people in the area. Karunagappally is well connected by road and rail. The taluk is bounded on the North by Kayamkulam, East by Kunnathur taluk, South by Kollam and on the West by the Arabian Sea. As of 2001 census of India, which classified Karunagappally as rural, it had a population of 410,514, males being 199,494 and females 211,020. The sex ratio of the taluk is 1058 which is equal to the sex ratio of the State of Kerala. The population density of the taluk is approximately 2000 persons per square km. The taluk has an average literacy rate of 89.5%, which is higher than the national average (Census of India 2001). The map of the study area is given in fig. 2.

4.2. Natural Background Radiation Cancer Registry (NBRR)

This study is a part of a cohort study which aims to determine the association between natural background radiation and cancer. The cohort study was initiated by Regional Cancer Centre (RCC), Trivandrum, Kerala, India in 1990. RCC was established in 1981 jointly by the Government of Kerala and the Government of India and is a comprehensive cancer centre catering to the needs of the population of the State of Kerala and the adjoining parts of Tamil Nadu and Karnataka. RCC has collaborations with many national and international agencies for conducting a

wide range of cancer research. The cohort study undertaken by RCC is known as the Natural Background Radiation Cancer Registry (NBRR).

The coastal areas of Karunagapplly taluk is interrupted with deposits of ilmenite sands containing radioactive material thorium. It is reported that these sands originate from the hilly rocks and flow down through the rivers and, through an action similar to panning, get deposited along the coast. The radioactivity of the sands is due to the monazite component which contains thorium and a limited amount of uranium, along with ores bearing several other rare earth minerals, such as rutile, sillimanite, zircon and titanium (WHO Technical Report 166, 1959).

Exposure to radiation, such as medical, occupational, nuclear accidents etc. has been shown to increase the risk of cancer. But the effects of low doses of radiation are estimated on extrapolations from high dose effects, and sometimes uncertainty about such extrapolated effects is voiced. A cohort study was initiated in 1990 named Natural Background Radiation Cancer Registry (NBRR) by the Regional Cancer Centre, Trivandrum to determine the effect of low dose natural background radiation and cancer occurrence in the population. The main objectives of the study were to answer the following.

What is the cancer incidence in the radiation belt area in Kerala?
Is the cancer incidence different from that in other population groups?
What is the pattern of cancer in the area?
Is the cancer incidence different from that in other areas?
Are the incidence and pattern related to Background Radiation?

As cancer is known to be associated with several lifestyle factors, to assess and evaluate the causative effect of exposure to radiation one has to critically assess the presence of such life style factors in the population. Among such factors tobacco use is the most pronounced. A baseline survey of the population residing in Karunagappally taluk was therefore undertaken, in which several life style factors were recorded as potential confounders and competing risk factors. These records are the data source of the present study.

4.3. Study Design

Trained enumerators visited all the 76942 houses in the taluk between January 1990 and December 1997 to collect data about the population and its life style and related factors. A six-page structured questionnaire (Appendix 3) was used to collect the information on household details, socio-demographic factors, dietary factors, life style and tobacco use. Each individual was enumerated and interviewed

to collect such information. Socio-demographic factors included were age, gender, religion, family income (in Indian rupees), education, occupation and marital status. Detailed history on alcohol consumption also was enquired. As tobacco use is one of the risk factors for cancer, information on the use tobacco was sought in detail. Separate questions for bidi smoking, cigarette smoking and the use of smokeless tobacco were included in the questionnaire. All these habituees were further questioned to know the amount of tobacco smoked during a single day, age of starting and the duration of use.

A 10% random checking of the accuracy of data collection was done by the supervisors by conducting a second house to house visit in the same area. Analysis of this data showed no major error in the data collection. The socio-demographic data and data on tobacco habits of the individuals above the age of 14 years of the radiation study are used for the present study.

4.4 Variables included

Different forms of tobacco use, bidi smoking, cigarette smoking, combination (bidi+cigarette) smoking and tobacco chewing were the dependent variables. Gender, age, religion, marital status, education, occupation and income were the demographic variables included in the study. Another variable used in the study was alcohol use.

The three major religions practiced in the study area were Hinduism, Christianity and Islam. Education was reported as illiterate, informal education, primary, middle, high school and college educated. These parameters were grouped either as illiterate (no education) or literate (the others). Occupation was grouped as unemployed and unskilled, semi-skilled, skilled, clerical, semi-professional and professional occupations. In this research income was grouped as below average (with income <1200 Indian rupees per month), average (1200-2500 Indian rupees per month) and above average (>2500 Indian rupees per month). In the case of males, age was divided into four groups: <30 years, 30-39 years, 40-49 years and 50 years or more. In the case of females, age was grouped into two groups as <50 years and >=50 years. The marital status was categorized as single or ever married. Ever married included married, divorced and widowed.

4.5 Data Management and analysis

The data collected were entered into dBase programme by the trained data entry operators. A 10% re-entry was done to check the accuracy of data entry, and this was done by another data entry operator. The data was then transferred to SPSS-18 (PASW-18) software for final analysis.

The prevalence of each habit was calculated separately for gender, age group, religious group, educational group, occupational group, SES group and for alcohol habituees. As the present study is a cross-sectional study, which relates the prevalence of tobacco use and its demographic determinants, prevalence odds ratios were calculated by logistic regression. Persons with unknown tobacco habits were assumed to be non-users. Persons with unknown values of socio-demographic data were excluded. Among the bidi smokers, data pertaining to occupation and income of 152 individuals were missing and therefore the 152 values were not included in the analysis. This applies to all determinants and to all forms of tobacco habit.

Binary logistic regression was performed to evaluate the role of determinants of different forms of tobacco use. Univariate binary logistic regression was used to get the crude OR and multivariate logistic regression was used to get the adjusted OR. Variables which were statistically significant in univariate models were included in the multiple logistic regression model to get the adjusted OR. For each variable, all other variables were considered as confounders.

The Population Attributable Risk (PAR) indicates the proportion of cases that would be possible to prevent if the factor was a causal one were eliminated. The PAR depends on OR and the prevalence of determinant. PAR was calculated using the formula

$$PAR = P(RR-1) / 1 + P(RR-1)$$

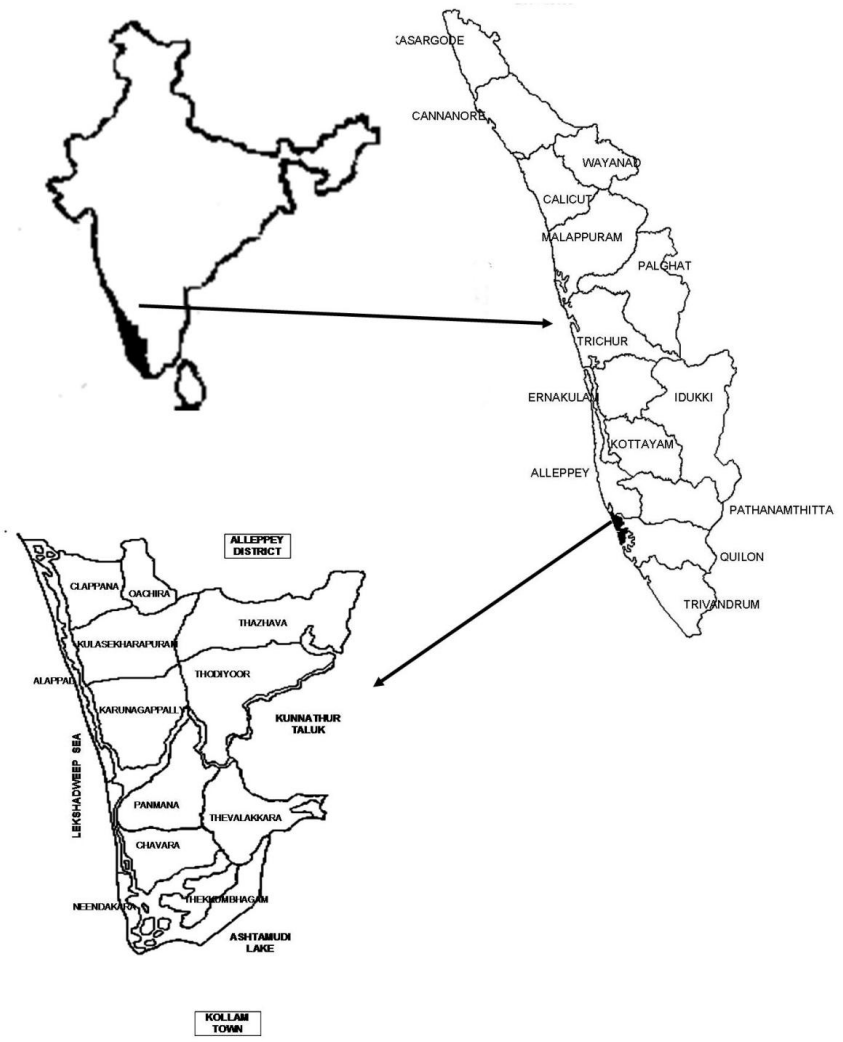
where

P is the prevalence of the exposure

RR is the relative risk due to that exposure.

In the applications adjusted ORs were used to substitute the RRs.

Fig. 2
Map of Study area



5. RESULTS

5.1 Socio-demographic profile

A total of 205,434 individuals above the age of 14 years were included in the study. Of these, 92,941(45%) were men and 112,493 (55%) women. The sex ratio observed was 1210 women to 1000 men. One of the reasons for the deviant sex ratio may be due to migrant male workers. The socio-demographic factors considered in the present study were gender, age, religion, marital status, education, occupation and income.

Of the total, 14% men and 15% women were above the age of 60 years (table 4). Only three religious groups were observed in the study area. Of the total interviewed, 69% were Hindus and the remaining were Muslims or Christians. For the purpose of the study, marital status was divided into two groups, single and married. Single included the never married individuals and married included the ever married. It was observed in the present study that 71% were married (63% among men and 78% among women). Among men 58% were educated up to high school level, while among women 51% were educated up to high school level. Less than 1% of both men and women were illiterate. Those illiterate and with informal education were grouped together in the analysis. As for occupation, more than 60% of the participants were either unskilled workers or unemployed. These two groups were considered together in the analysis; the other groups were semi-skilled, skilled and others. On the basis of income, the sample was grouped into three categories. In the present study, 41% of men and 40% of women were in average category of income group. Only 29% of men and 30% of women were in the high income category. Data on the income of 30 individuals were not available (table 5).

Table 4
Number and percentage distribution of the Karunagappally cohort by age and gender

Age Group	Gender				Total
	Men		Women		
	Number	%*	Number	%**	
15-19	14163	15.24	16310	14.50	30473
20-24	12827	13.80	15212	13.52	28039
25-29	9688	10.42	13676	12.16	23364
30-34	8450	9.09	11552	10.27	20002
35-39	8590	9.24	11086	9.86	19676
40-44	7891	8.49	8765	7.79	16656
45-49	7424	7.99	7744	6.88	15168
50-54	5323	5.73	5689	5.06	11012
55-59	5265	5.66	5852	5.20	11117
60-64	4647	5.00	5435	4.83	10082
65-69	3819	4.11	4820	4.29	8639
70-74	2443	2.63	2902	2.58	5345
75-79	1294	1.39	1793	1.59	3087
80+	1117	1.21	1657	1.47	2774
Total	**92941**	**100.0**	**112493**	**100.0**	**205434**

*Percentage of total men **Percentage of total women

Table 5

Number and percentage distribution of the Karunagappally cohort by Demographic characteristics

Variables		Gender				Total	
		Men		Women			
		Number	%*	**Number**	%**	**Number**	%***
Religion	Hindu	64591	69.5	76703	68.2	141294	68.7
	Christian	6776	7.3	8147	7.2	14923	7.3
	Islam	21574	23.2	27643	24.6	49217	24.0
Marital Status	Single	34836	37.5	24595	21.9	59431	28.93
	Married	58105	62.5	87898	78.1	146003	71.1
Education	Illiterate & Informal education	5061	5.5	14128	12.6	19189	9.3
	Primary	16077	17.3	20930	18.6	37007	18.0
	Middle	18392	19.8	20298	18.0	38690	18.8
	High School	38459	41.4	39382	35.0	77841	37.9
	College and Professional	14952	16.1	17755	15.8	32707	15.9
Occupation	Unemployed & Unskilled	56198	60.5	84318	75.0	140516	68.4
	Semi-skilled	11692	12.6	20494	18.2	32186	15.7
	Skilled	17085	18.4	3907	3.5	20992	10.2
	Clerical	4620	5.0	569	0.5	5189	2.5
	Semi-professional	2715	2.9	2450	2.2	5165	2.5
	Professional	385	0.4	596	0.5	981	0.5
	Unknown	246	0.2	159	0.2	405	0.2
Income	Below Average	27381	29.5	34487	30.7	61868	30.1
	Average	38314	41.2	44812	39.8	83126	40.5
	Above Average	27233	29.3	33177	29.5	60410	29.4
	Total	**92928**	**100.0**	**112476**	**100.0**	**205404**	**100.0**

*Percentage of total men **Percentage of total women ***Percentage of total

5.2 Prevalence of tobacco use

Among men 43% and among women 84% had never used any form of tobacco products in their life time (table 6). Among women, smokeless tobacco use was more prevalent than any other type of smoking, whereas among men smoking was more common than chewing. Among those who smoked, the most prevalent practice was to use both bidis and cigarettes (25%) when compared to smoking bidi or cigarette alone. The prevalence of smokeless tobacco was 26% among men. Among all the women participants, 1% was bidi smokers whereas a negligible percent had the habit of using cigarette alone or in combined form. The prevalence of smokeless tobacco habit was 15% in women, which was much lower compared to that among men.

Table 6
Number and percentage distribution of the Karunagappally cohort by different forms of tobacco use and gender

Habit	Gender			
	Men		Women	
	Number	%	Number	%
Only bidi smoking	9750	10.5	1146	1.0
Only cigarette smoking	14439	15.5	45	--
Combined (bidi + cigarette) smoking	22819	24.6	48	--
Smokeless tobacco	23731	25.5	17274	15.4
No tobacco user	40150	43.2	94759	84.2

5.3 Prevalence of tobacco use by socio-demographic determinants

The mode of tobacco consumption was first divided into two categories, namely smoking and smokeless form. Smoked tobacco was further grouped into three types based on the tobacco products used: bidi, cigarette and combined (both bidi and cigarette). Each type of habituees was analysed separately and the factors associated with the respective habits identified.

5.3.1. Only bidi smoking in men

A total of 9750 men who had the bidi smoking habit were compared with the 40150 men who did not use any form of tobacco. The distribution of all variables according to their habit of bidi use is given in table 7.

Among men, as age increased, the prevalence of bidi smoking habit also increased. In the age group of below 30 years bidi smoking was present only among 1% of the participants, whereas it was 26.9% in the age group 50 years and above. With regard to religion and the habit of bidi smoking, 11% of people of Hindu religion were bidi smokers, whereas the lowest prevalence of bidi smoking habit, i.e. 7%, was observed among those of Christian religion. The prevalence of bidi smoking was 16% among the married when compared to the single in whom it was 1%. The prevalence of bidi smoking was high in the illiterate and informal education group compared to all others. As the level of education increased, the prevalence of bidi smoking decreased and reached 0.9% among those who had completed college education.

Bidi smoking had higher prevalence among men in the unemployed, unskilled and semi-skilled workers groups compared to the other occupational categories. With regard to income, the prevalence of bidi smoking was higher in the below average income group compared to the average and the above average income groups. The prevalence observed was 23% among those with income below average.

5.3.2 Only cigarette smoking in men

Among men, with regard to cigarette smoking the highest prevalence observed (23%) was in the age group 30-39 years. This figure started decreasing with age, reaching a level of 12% in those above 50 years (table 7). The prevalence of cigarette smoking was more or less similar in all the three religious groups. The

prevalence observed among the married group was 18%, which was higher than that of the single (11%). As for the educational status and cigarette use, those with a lower education level had a lower prevalence than those with a higher education. Among the unemployed and unskilled workers the prevalence was less than in those with a higher grade occupation. It was observed that the prevalence of cigarette smoking habit increased as the income level increased.

Table 7
Prevalence of bidi only and cigarette only smoking among men in Karunagappally cohort according to socio-demographic characteristics

Variables	Bidi alone		Cigarette alone	
	Number	%*	Number	%**
Age group in years				
<30	412	1.1	4570	12.5
30-39	1117	6.6	3935	23.1
40-49	1789	11.7	3033	19.8
50+	6432	26.9	2901	12.1
Religion				
Hindu	6957	10.8	10191	15.8
Christian	498	7.3	1118	16.5
Islam	2295	10.6	3130	14.5
Marital Status				
Single	483	1.4	3892	11.2
Married	9267	15.9	10547	18.2
Education				
Illiterate & informal	1585	31.3	360	7.1
Primary	4115	25.6	1589	9.9
Middle	2678	14.6	2929	15.9
High School	1244	3.2	7194	18.7
College	128	0.9	2367	15.8
Occupation				
Unemployed & Unskilled	6003	10.7	6878	12.2
Semi-skilled	1990	17.0	1810	15.5
Skilled	1438	8.4	3620	21.2
Clerical	165	3.6	1419	30.7
Semi-professional & professional	143	4.6	678	21.9
Income				
Below Average	5030	18.4	1853	8.3
Average	4013	6.8	6941	14.5
Above average	696	3.1	5611	24.8
Total	**9750**	**10.5**	**14439**	**15.5**

*Percentage of Bidi smokers in each group **Percentage of Cigarette smokers in each group

5.3.3 Combined (bidi and cigarette) smoking in men

It was observed that among men 25% used both bidis and cigarettes. The prevalence of smoking using combined forms of tobacco (both bidi and cigarette) increased as age increased (table 8). The prevalence observed in the age group of below 30 years was 7%, far lower than the 40% in the age group 40-49 years. There was no significant difference in prevalence with regard to the different religions. With regard to marital status, the prevalence observed was sevenfold higher in the married when compared to the single. Among the participants who had education up to college level, the prevalence observed was 5%, whereas among those with only primary education, the prevalence was 44%, which amounts to an eightfold increase. Among those with white collar occupations (clerical, semi-professional and professional) the prevalence was less than that in other occupations. An inverse association was observed between income level and the prevalence of combined smoking habit.

5.3.4 Smokeless tobacco use in men

Among men 26% used smokeless tobacco. The prevalence of the habit of tobacco chewing increased as age increased (table 8). In the age group 50 years and above, the prevalence of smokeless tobacco use was 38%, which was more than three times the prevalence in the age group of less than 30 years. In the different religious groups, the prevalence of smokeless tobacco was higher among the Hindus when compared to that in the other two. Among the married, the prevalence of smokeless tobacco habit was 35%, higher than among the single (10%). The prevalence of smokeless tobacco was inversely associated with the level of education and showed very low prevalence among the highly educated. Among participants educated up to college level, the prevalence of smokeless tobacco habit was 10% when compared to 39% among those who had only primary level education. There was not much variation in prevalence in relation to occupation. As found in the case of the combined smoking habit, an inverse association was observed between the income level and prevalence of smokeless tobacco habit.

Table 8

Prevalence of Combined Smoking and Smokeless tobacco Habit among men in Karunagappally cohort according to socio-demographic characteristics

Variables	Combined		Smokeless	
	Number	%*	Number	%**
Age				
<30	2366	6.5	4208	11.5
30-39	5366	31.5	4948	29.0
40-49	6122	40.0	5445	35.6
50+	8965	37.5	9130	38.2
Religion				
Hindu	15966	24.7	18636	28.9
Christian	1821	26.9	1197	17.7
Islam	5032	23.3	3898	18.1
Marital Status				
Single	1706	4.9	3514	10.1
Married	21113	36.3	20217	34.8
Education				
Illiterate & informal	1832	36.2	1668	33.0
Primary	7030	43.7	6333	39.4
Middle	6958	37.8	6446	35.0
High School	6318	16.4	7843	20.4
College	681	4.6	1441	9.6
Occupation				
Unemployed & Unskilled	13168	23.4	13393	23.8
Semi-skilled	4060	34.7	3797	32.5
Skilled	4185	24.5	4680	27.4
Clerical	874	18.9	1095	23.7
Semi-professional & Professional	489	15.8	722	23.3
Income				
Below Average	7800	34.9	7392	33.0
Average	11675	24.5	11693	24.5
Above average	3301	14.6	4602	20.4
Total	**22819**	**24.6**	**23731**	**25.5**

*Percentage of combined smokers in each group **Percentage of smokeless tobaccoin each group

5.3.5 Bidi smoking in women

In the present study there were 1146 women with the habit of bidi smoking, thus making the prevalence of bidi smoking habit among women 1% (table 9). While taking into account the gender-specific prevalence rate, this figure was much lower when compared to the smokeless tobacco habit. Among those in the age group of above 50 years, the prevalence of bidi smoking observed was 4%. There were no statistically significant differences in the bidi smoking habits among women of different religious groups. The prevalence of bidi smoking was low in the single when compared to that in the married. Bidis were smoked only by those who were educated below or up to middle school. The occupation-specific prevalence showed that bidi smoking was more common in the semi-skilled workers than in all other occupational groups. An inverse association was observed between the bidi smoking habit and the income level. In the above average income group, the prevalence was negligible while in the below average group it was 3%.

5.3.6 Smokeless tobacco in women

A positive correlation was observed between age and prevalence of smokeless tobacco habit among women (table 9). Among women in the age group of below 50 years, the prevalence observed was <1% while in the age group of above 50 years it was much higher (43%). The prevalence of the use of smokeless tobacco was highest among Hindus (17%), followed by Muslims and then by those of the Christian religion. Among the married, prevalence of the use of smokeless tobacco observed was 19%, whereas among the single, it was 1%. There was an inverse relationship observed between education and the prevalence of smokeless tobacco use. Among women who were illiterate or had only informal education the prevalence was 45%, whereas among women educated up to college level it was <1%. The smokeless tobacco habit was more prevalent among semi-skilled workers than in the other occupational groups. Among women, too, there was an inverse association observed between smokeless tobacco habit and the income level. In the above average income group, the prevalence was 2% whereas in the below average group the prevalence observed was 31%.

Table 9

Prevalence of bidi smoking and smokeless tobacco habit among women in Karunagappally cohort according to socio-demographic characteristics

Variables	Bidi		Smokeless	
	Number	%	Number	%
Age				
<50	104	0.1	5214	6.2
50+	1042	3.7	12060	42.8
Religion				
Hindu	646	0.8	12643	16.5
Christian	72	0.9	611	7.5
Islam	428	1.5	4020	14.5
Marital status				
Single	16	0.1	245	1.0
Married	1130	1.3	17029	19.4
Education				
Illiterate & informal	683	4.8	6414	45.4
Primary	364	1.7	6541	31.3
Middle	99	0.1	3084	15.2
High School	--	--	1166	3.0
College	--	--	69	0.4
Occupation				
Unemployed & Unskilled	632	0.7	11076	13.1
Semi-skilled	501	2.4	5905	28.8
Skilled	--	--	165	4.2
Others	12	0.2	111	3.1
Income				
Below Average	868	2.5	10814	31.2
Average	273	0.4	6146	9.9
Above average	4	--	297	1.9
Total	1146		17274	

*Percentage of Bidi smokers in each group **Percentage of smokeless tobacco in each group

5.4 Prevalence of type of tobacco use among alcohol habituees

This study observed that the prevalence of tobacco use was higher among those who had the habit of alcohol consumption than among non-alcohol users. Among men with the habit of drinking alcohol, the prevalence of bidi smoking was 14.3%, cigarette smoking 24.3%, the combined use of tobacco smoking 46.9% and the smokeless tobacco use was 45.5%. Only a few women had the habit of using alcoholic drinks. Among these, the prevalence of bidi smoking habit was 30% and among the non-users 1% (table 10).

Table 10
Number and prevalence (%) of tobacco habit among alcohol users and non-users in Karunagappally cohort

Habit			Alcohol use	
			Yes	No
Men				
	Bidi	No.	4321	5429
		%	14.3	12.6
	Cigarette	No.	7336	7103
		%	24.3	15.9
	Combined	No.	14168	8651
		%	46.9	18.7
	Smokeless	No.	13748	9983
		%	45.5	21.0
	No tobacco use	No.	2491	39776
		%	8.2	63.4
	All men	**No.**	**30209**	**62732**
Women				
	Bidi	No.	19	1127
		%	30.0	1.2
	Smokeless	No.	35	17239
		%	54.7	15.4
	No tobacco use	No.	5	93938
		%	7.8	83.6
	All women	**No.**	**64**	**112429**

5.5 Associations of tobacco use with socio-demographic determinants

The effect of the demographic variables on the risk of tobacco use were measured more specifically by Odds Ratios in addition to the crude prevalence. Odds Ratios were also adjusted for all the demographic variables (age, religion, marital status, education, occupation and income).

5.5.1 Tobacco use and socio-demographic determinants: Men

Among men, the age was a significant determinant for the use of any type of tobacco product. Among youngsters all types of habits were less common. Bidi smoking, alone or combined, was strongly age-related. Much of the effect by age could be accounted largely by the confounding effects of the other risk factors. The effect of age on bidi smoking remained strong, the OR being 16.2 respectively in the age group of 50 years and higher compared to men aged below 30 years of age. In the case of other tobacco use categories, the association was much weaker. The range in ORs varied between 1.3 to 4.1 depending on the type of tobacco use and the age group (table 11,12, fig. 3-6).

The crude and adjusted OR for religion and tobacco habit was calculated, and a statistically significant association observed. Consistently in any of the types of smoking, Hindus had the highest prevalence compared to Christians and Muslims. The differences however were small (table 11,12, fig. 7-10).

With regard to marital status, both bidi smoking (only or combined) and chewing were more prevalent among the married than in the single men. The strong association could be mainly accounted for by the other risk factors, and the prevalence was four to six times higher in the married than in the single men consistently in all smoking categories. The adjusted OR showed that married men were 4.3 times more likely to smoke bidi compared to the single men, and for cigarette smoking it was 3.3 times. The adjusted OR for both combined smoking habit and smokeless tobacco habit was 6.5 and 4.1 respectively (table 11,12, fig. 11-14).

Educational status was also found to play a major role in the prevalence of different types of tobacco habits. As educational status increased, the prevalence of any tobacco habit decreased. Compared to illiterates those educated up to college level had 87% less chance for bidi smoking and 82% less chance for combined smoking habit. But in the case of cigarette smoking, the reduction observed was only 35%. Compared to the use of other two tobacco products, this reduction was

much less but the difference observed was statistically significant. Smokeless tobacco habit was 73% less prevalent in the college educated group than in the illiterate and informal education groups (table 11,12, fig. 15-18).

Among semi-skilled, skilled and semi-professional and professional men, the habit of bidi smoking was more prevalent than among the unemployed and the unskilled persons. Among clerical workers there was a statistically significant reduction observed with regard to bidi smoking. In the case of cigarette smoking, the adjusted OR was higher in all other occupational groups than in the unemployed group. With regard to both the combined smoking habit and the smokeless tobacco habit there was an increase in the adjusted OR. However, the variation in the adjusted OR was small and the occupation was not a major determinant of the prevalence of tobacco use (table 11,12, fig. 19-22).

All types of tobacco habits except cigarette smoking showed a negative association with income. As income increased the prevalence of bidi smoking, combined smoking habit or smokeless tobacco habit decreased. But in the case of cigarette smoking, as income increased, the cigarette smoking habit too became more prevalent. The association between smoking and income was only marginally affected by the other determinants of the tobacco habit. In the above average income group there was more than 80% reduction in the bidi smoking habit compared to the below average income group, and the reduction with regard to combined smoking habit was 60% and smokeless tobacco habit 39%. The prevalence of cigarette smoking was 67% higher than in the above average income group compared to the below average income group (table 11,12, fig. 23-26).

5.5.2. Tobacco use and socio-demographic determinants: Women

Among women whose ages were above 50 years, the adjusted OR for bidi smoking habit was about 15.5 times higher than that in those below the age of 50 years. As regards the smokeless tobacco habit, there was a fourfold increase of use among women above the age of 50 years, when compared to those who were below 50 years of age (table 13).

Among women, the bidi smoking habit was more prevalent among those in Muslim and smokeless tobacco habit more prevalent among Hindus. Among Christian women the prevalence of smokeless tobacco consumption was 61% less than that among Hindu women (table 13).

With regard to the bidi smoking habit, the OR observed was high among married women when compared to the prevalence of the practice among single women. The smokeless tobacco habit was also found to a significantly high extent

in married women (table 13). Much of the high prevalence could be accounted for by the confounding effect of the other risk indicators.

As the level of education in women increased, the bidi smoking habit and smokeless tobacco habit decreased. Among those with middle school education or above, the habit of bidi smoking was found to be 84% less prevalent than in women who were illiterate or had had informal education. There were no bidi smokers among women who had received high school or college education. The smokeless tobacco habit was 97% less prevalent among women having education up to the college level than in the illiterate or informally educated women.

Occupation was found to be a significant factor for bidi smoking and the smokeless tobacco habit. It was observed that among the semi-skilled workers and other occupational groups there was at least 40% higher chance of bidi smoking habit than in the unemployed or unskilled workers. Tobacco habits were rare among the skilled workers.

As the income level increased, the use of tobacco decreased. The adjusted OR was found to be much lower in the above average income group as regards both bidi smoking and smokeless tobacco habit.

Table 11

Crude and Adjusted OR for bidi and cigarette smoking among men in Karunagappally cohort

Variables	Bidi			Cigarette		
	Crude	Adjusted	CI	Crude	Adjusted	CI
Age group (in Years)						
<30	1.00	1.00	--	1.00	1.00	--
30-39	13.83	3.84	3.29-4.47	4.39	1.53	1.42-1.65
40-49	36.20	7.96	6.83-9.27	5.53	1.66	1.53-1.81
50+	110.74	16.18	13.93-18.79	4.50	1.30	1.19-1.42
Religion						
Hindu	1.00	1.00	--	1.00	1.00	--
Christian	0.62	0.60	0.53-0.68	0.95	0.91	0.84-0.98
Islam	0.87	0.90	0.83-0.97	0.81	0.84	0.80-0.89
Marital Status						
Single	1.00	1.00	--	1.00	1.00	--
Married	39.93	4.28	3.73-4.90	5.64	3.27	3.05-3.51
Education						
Illiterate & Informal education	1.00	1.00	--	1.00	1.00	--
Primary	1.11	1.12	0.99-1.25	1.89	1.35	1.17-1.56
Middle	0.37	0.92	0.81-1.05	1.78	1.43	1.24-1.66
High School	0.04	0.38	0.32-0.44	0.93	1.00	0.86-1.15
College	0.01	0.13	0.11-0.17	0.58	0.65	0.55-0.76

Table 11 continued

Crude and Adjusted OR for bidi and cigarette smoking among men in Karunagappally cohort

Variables	Bidi			Cigarette		
	Crude	Adjusted	CI	Crude	Adjusted	CI
Occupation						
Unemployed & Unskilled	1.00	1.00	--	1.00	1.00	--
Semi-skilled	2.94	1.45	1.32-1.59	2.34	1.29	1.20-1.38
Skilled	0.98	1.26	1.14-1.40	2.16	1.36	1.27-1.45
Clerical	0.39	0.75	0.61-0.93	2.96	1.35	1.23-1.49
Semi-professional & Professional	0.42	1.03	0.82-1.30	1.73	1.04	0.93-1.16
Income						
Below Average	1.00	1.00	--	1.00	1.00	--
Average	0.23	0.47	0.43-0.51	1.08	1.36	1.26-1.46
Above Average	0.08	0.18	0.16-0.22	1.67	1.62	1.46-1.80

Table 12

Crude and Adjusted OR for combined smoking and smokeless tobacco habit among men in Karunagappally cohort

Variables	Combined			Smokeless		
	Crude	Adjusted	CI	Crude	Adjusted	CI
Age group (in Years)						
<30	1.00	1.00	--	1.00	1.00	--
30-39	11.57	2.66	2.46-2.88	6.00	1.76	1.64-1.89
40-49	21.57	4.06	3.73-4.41	10.79	2.56	2.37-2.77
50+	26.88	3.90	3.58-4.24	15.39	2.94	2.71-3.18

Table 12 continued

Crude and Adjusted OR for combined smoking and smokeless tobacco habit among men in Karunagappally cohort

Variables	Combined			Smokeless		
	Crude	Adjusted	CI	Crude	Adjusted	CI
Religion						
Hinduism	1.00	1.00	--	1.00	1.00	--
Christianity	0.99	0.93	0.86-1.01	0.56	0.51	0.47-0.55
Islam	0.83	0.84	0.79-0.88	0.55	0.56	0.53-0.59
Marital Status						
Single	1.00	1.00	--	1.00	1.00	--
Married	25.76	6.46	5.97-6.98	11.98	4.05	3.78-4.33
Education						
Illiterate & Informal education	1.00	1.00	--	1.00	1.00	--
Primary	1.64	1.37	1.24-1.52	1.63	1.31	1.18-1.45
Middle	0.83	1.17	1.05-1.31	0.85	1.07	0.97-1.20
High School	0.16	0.57	0.51-0.64	0.22	0.59	0.53-0.66
College	0.03	0.18	0.15-0.21	0.08	0.27	0.24-0.31
Occupation						
Unemployed & Unskilled	1.00	1.00	--	1.00	1.00	--
Semi-skilled	2.74	1.32	1.23-1.41	2.52	1.33	1.24-1.42
Skilled	1.30	1.28	1.19-1.37	1.43	1.38	1.29-1.47
Clerical	0.95	1.04	0.92-1.16	1.17	0.98	0.89-1.09
Semi-professional & Professional	0.65	1.08	0.94-1.24	0.95	1.16	1.03-1.30
Income						
Below Average	1.00	1.00	--	1.00	1.00	--
Average	0.43	0.79	0.74-0.85	0.46	0.83	0.78-0.89
Above Average	0.23	0.40	0.36-0.45	0.34	0.61	0.55-0.67

Table 13

Crude and Adjusted OR for bidi and smokeless tobacco habit among women in Karunagappally cohort

Variables	Bidi			Smokeless		
	Crude	Adjusted	CI	Crude	Adjusted	CI
Age group (in Years)						
<50	1.00	1.00	--	1.00	1.00	--
50+	50.46	15.53	12.47-19.33	11.65	3.95	3.78-4.12
Religion						
Hindu	1.00	1.00	--	1.00	1.00	--
Christian	0.95	1.06	0.82-1.36	0.41	0.39	0.36-0.43
Islam	1.80	1.52	1.32-1.75	0.87	0.74	0.71-0.78
Marital Status						
Single	1.00	1.00	--	1.00	1.00	--
Married	24.40	3.30	1.99-5.48	24.02	5.96	5.22-6.81
Education						
Illiterate & Informal education	1.00	1.00	--	1.00	1.00	--
Primary	0.28	0.50	0.43-0.58	0.54	0.65	0.62-0.69
Middle and above	0.02	0.16	0.12-0.21	0.21	0.39	0.36-0.42
High School	--	--		0.04	0.13	0.12-0.14
College	--	--		0.01	0.03	0.02-0.04
Occupation						
Unemployed & Unskilled	1.00	1.00	--	1.00	1.00	--
Semi-skilled	4.02	1.42	1.25-1.62	2.70	1.08	1.03-1.13
Skilled	--	--		0.29	0.71	0.60-0.85
Others	0.19	1.40	0.74-2.62	0.21	1.10	0.86-1.40
Income						
Below Average	1.00	1.00	--	1.00	1.00	--
Average	0.13	0.60	0.51-0.71	0.24	0.79	0.75-0.83
Above Average	0.01	0.08	0.03-0.23	0.04	0.55	0.47-0.65

Fig. 3
Adjusted Odds Ratio and CI for bidi smoking habit among male in Karunagappally cohort according to age groups

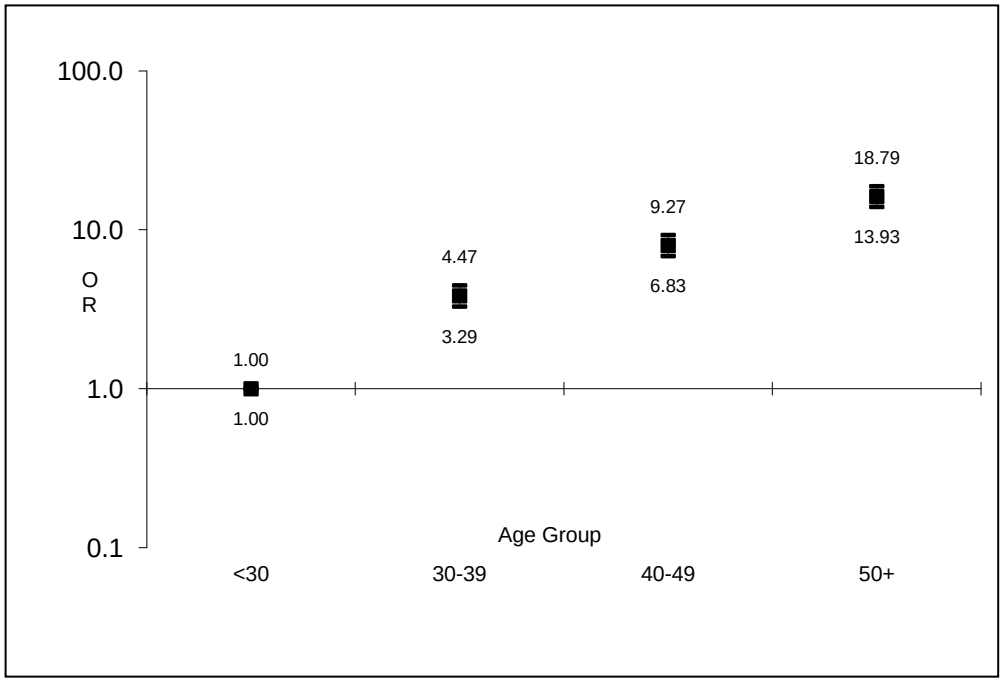


Fig. 4
Adjusted Odds Ratio and CI for cigarette smoking habit among male in Karunagappally cohort according to age groups

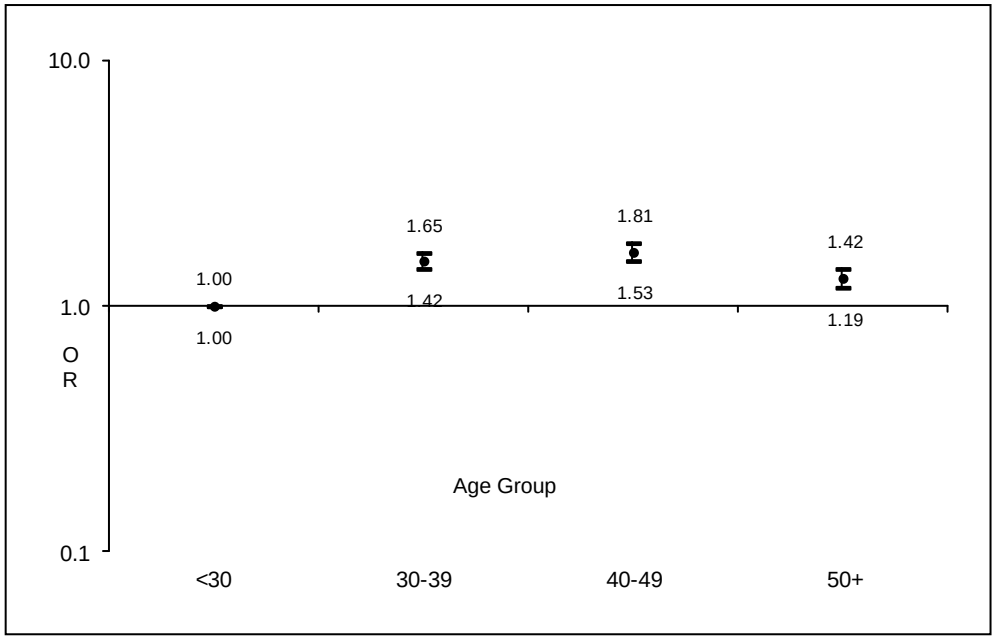


Fig. 5
Adjusted Odds Ratio and CI for combined smoking habit among male in Karunagappally cohort according to age groups

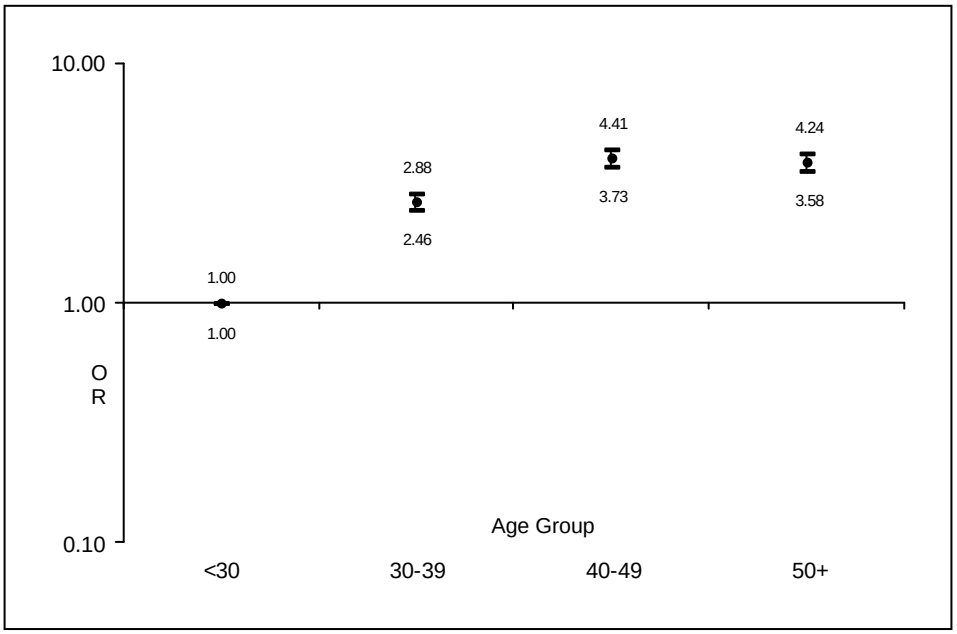


Fig. 6
Adjusted Odds Ratio and CI for smokeless tobacco habit among male in Karunagappally cohort according to age groups

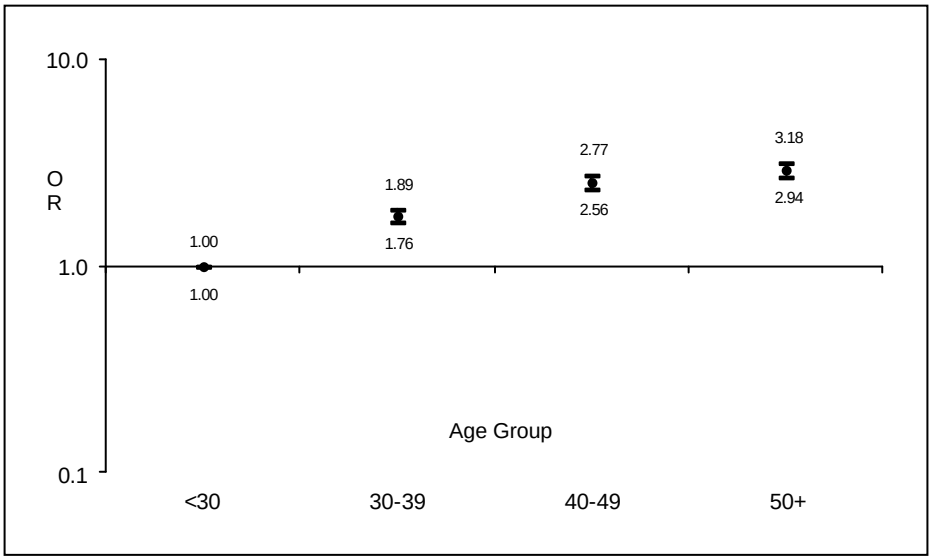


Fig. 7
Adjusted Odds Ratio and CI for bidi smoking habit among male in Karunagappally cohort according to religion

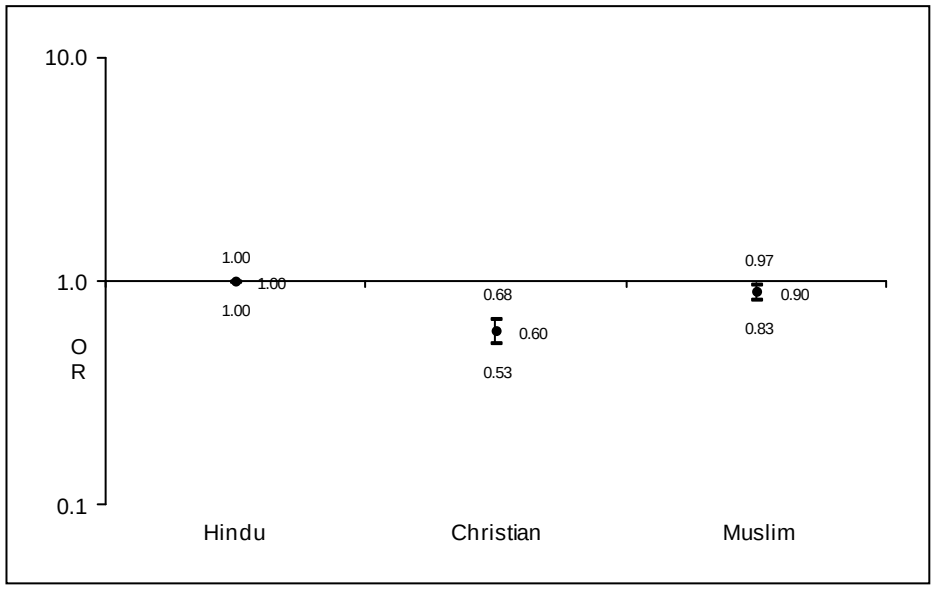


Fig. 8
Adjusted Odds Ratio and CI for cigarette smoking habit among male in Karunagappally cohort according to religion

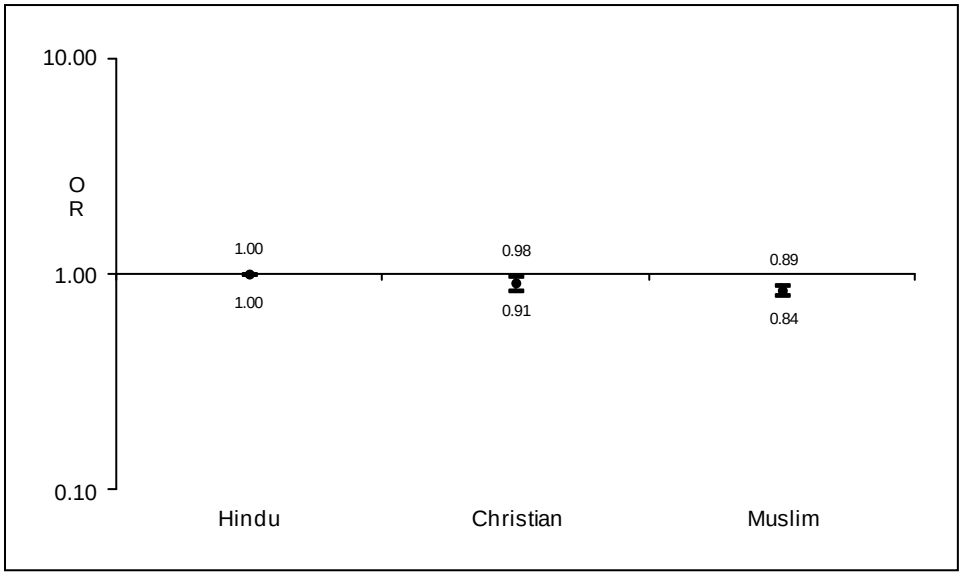


Fig. 9
Adjusted Odds Ratio and CI for combined smoking habit among male in Karunagappally cohort according to religion

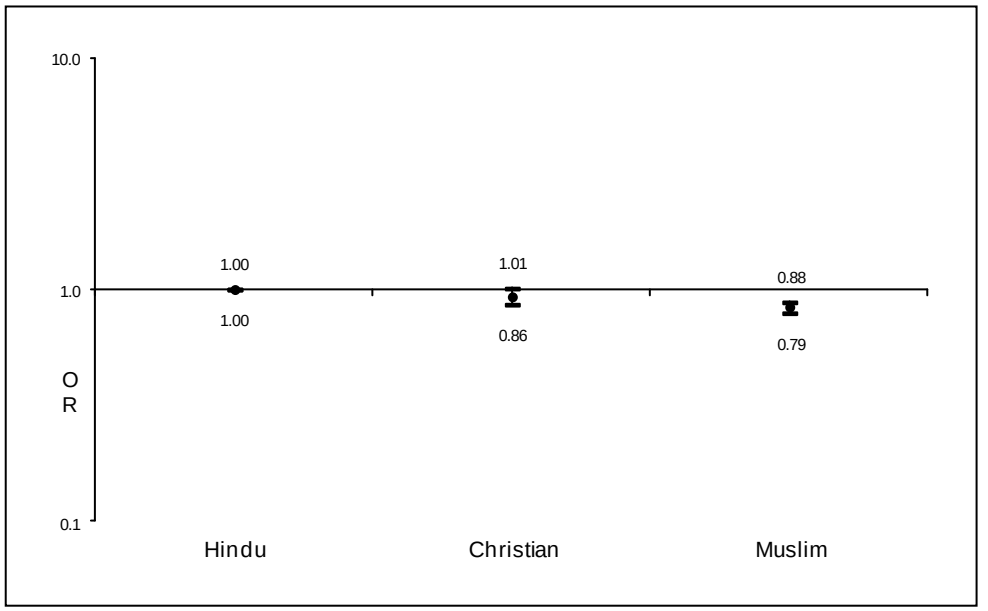


Fig. 10
Adjusted Odds Ratio and CI for smokeless tobacco habit among male in Karunagappally cohort according to religion

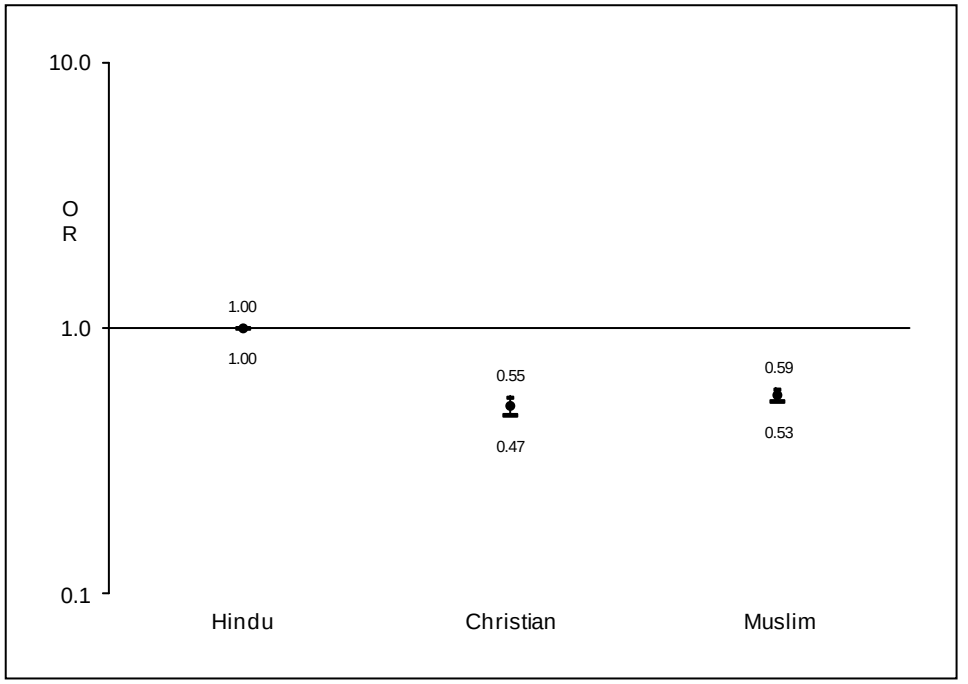


Fig. 11
Adjusted Odds Ratio and CI for bidi smoking habit among male in Karunagappally cohort according to marital status

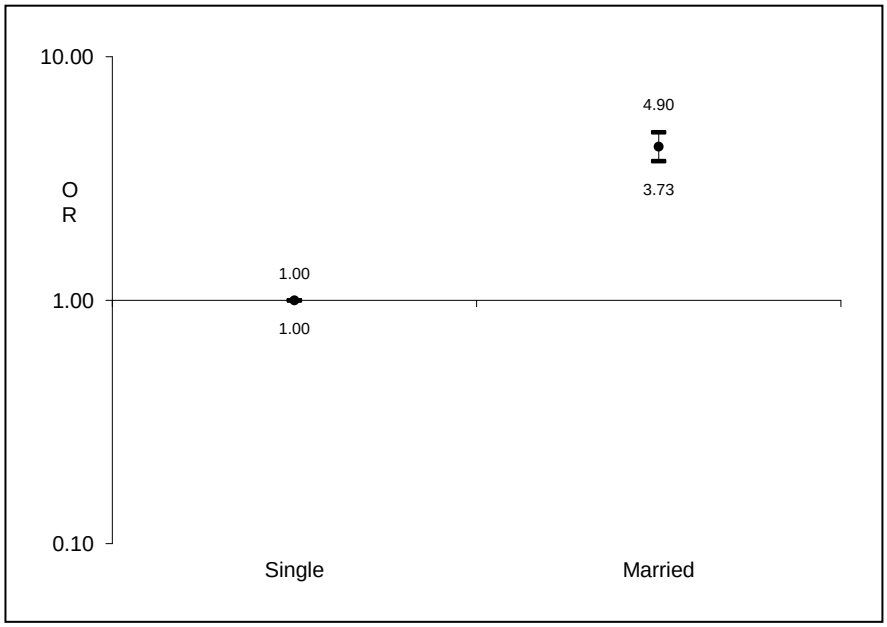


Fig. 12
Adjusted Odds Ratio and CI for cigarette smoking habit among male in Karunagappally cohort according to marital status

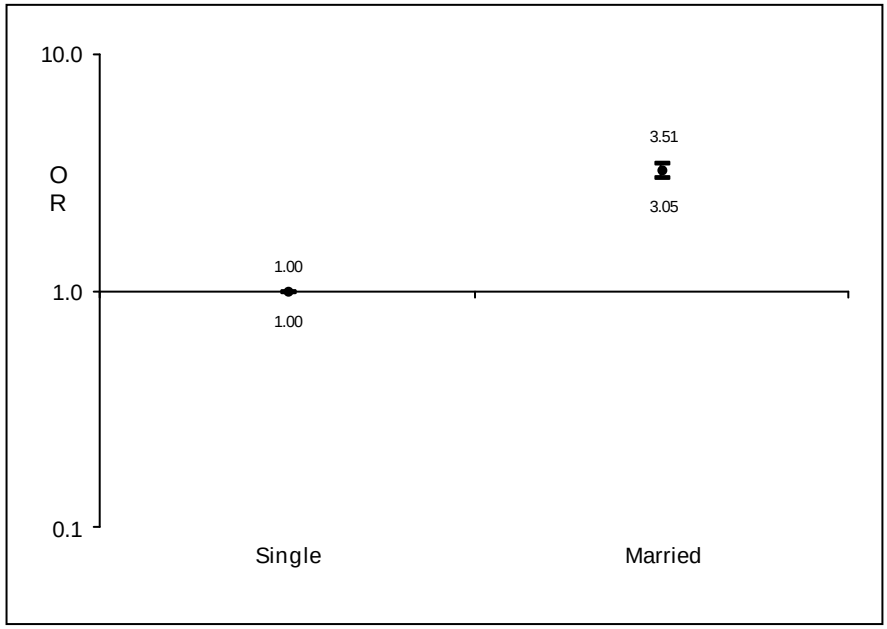


Fig. 13
Adjusted Odds Ratio and CI for combined smoking habit among male in Karunagappally cohort according to marital status

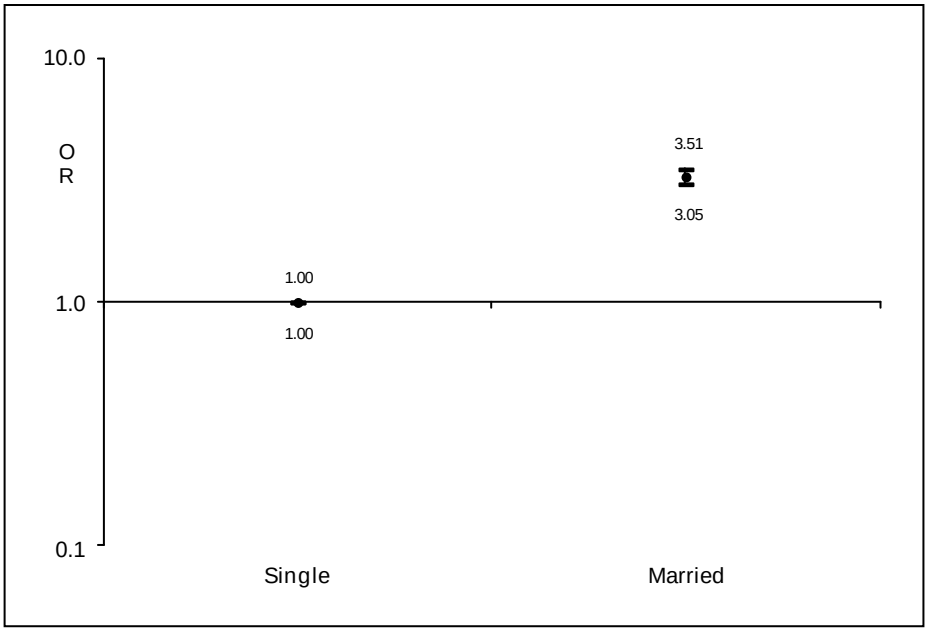


Fig. 14
Adjusted Odds Ratio and CI for smokeless tobacco habit among male in Karunagappally cohort according to marital status

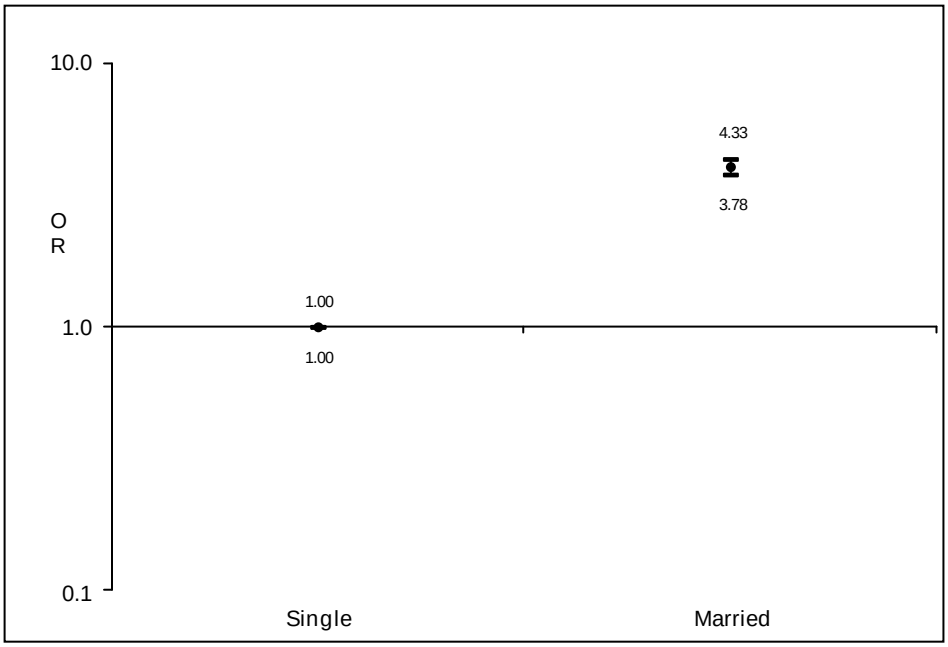


Fig. 15
Adjusted Odds Ratio and CI for bidi smoking habit among male in Karunagappally cohort according to education

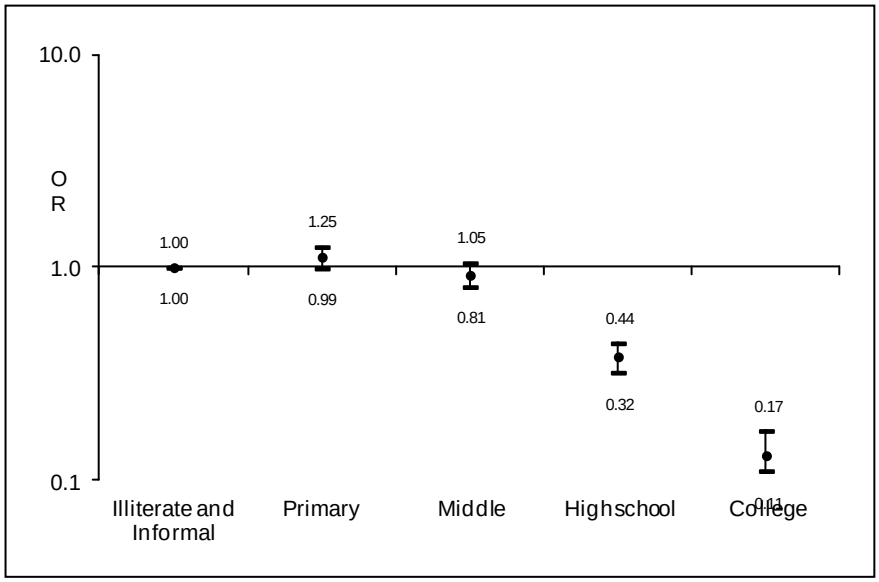


Fig. 16
Adjusted Odds Ratio and CI for cigarette smoking habit among male in Karunagappally cohort according to education

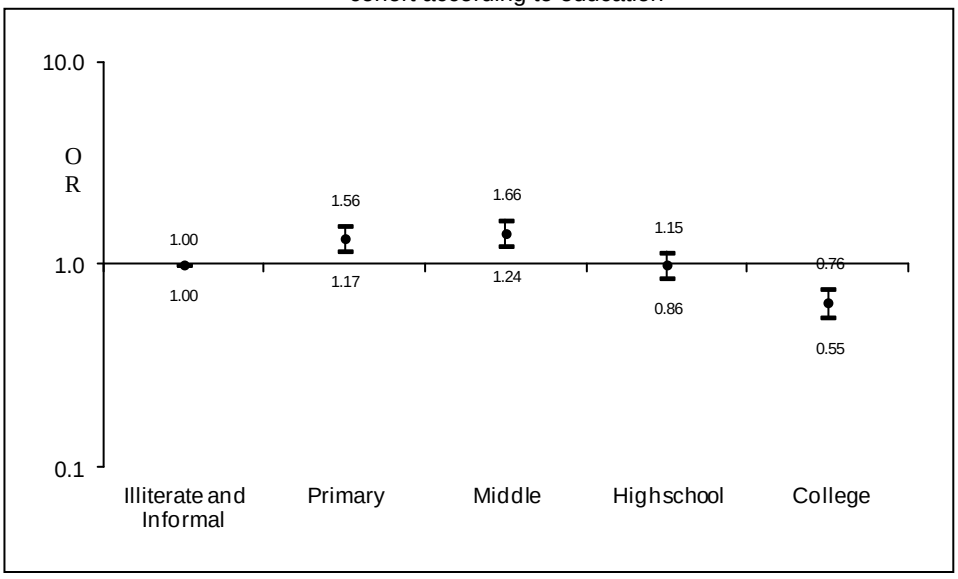


Fig. 17
Adjusted Odds Ratio and CI for combined smoking habit among male in Karunagappally cohort according to education

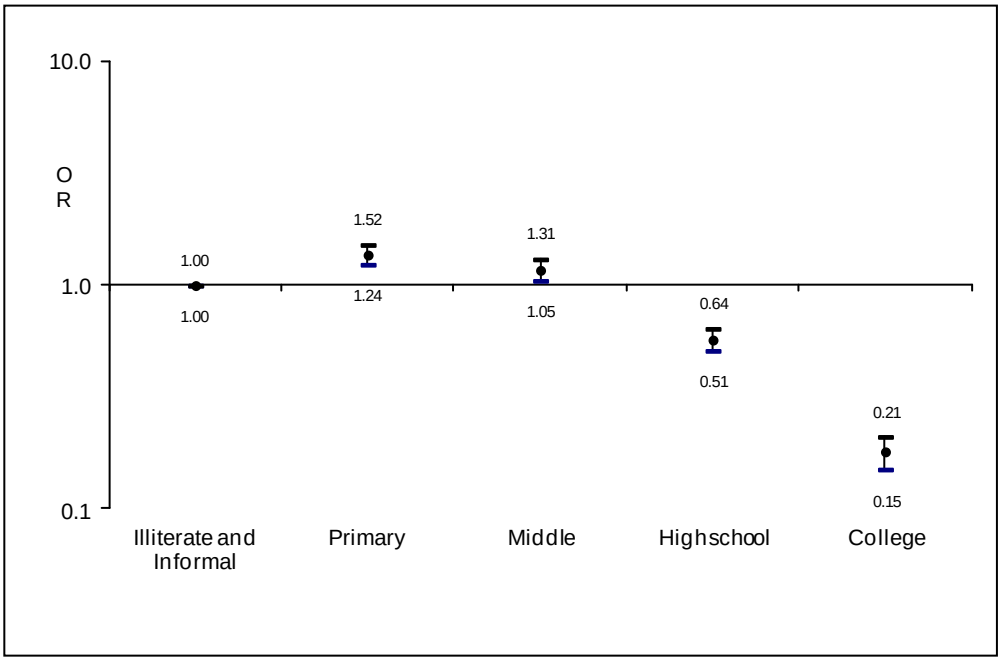


Fig. 18
Adjusted Odds Ratio and CI for smokeless tobacco habit among male in Karunagappally cohort according to education

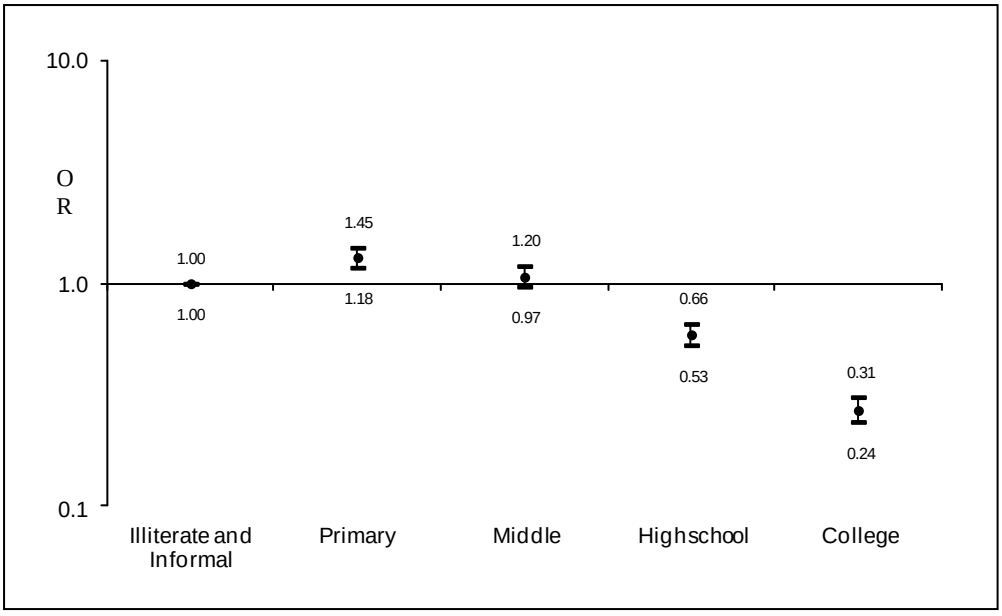


Fig. 19
Adjusted Odds Ratio and CI for bidi smoking habit among male in Karunagappally cohort according to occupation

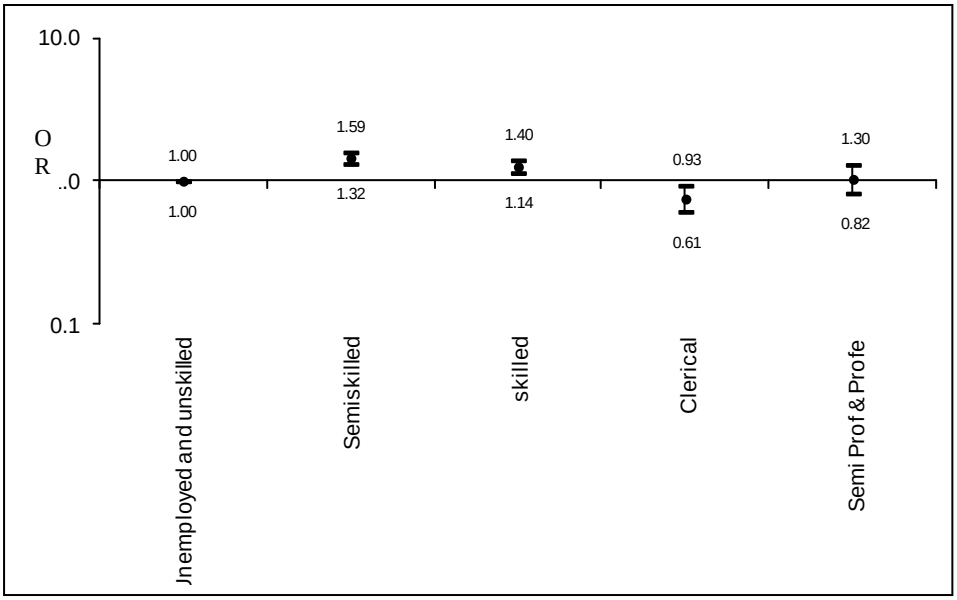


Fig. 20
Adjusted Odds Ratio and CI for cigarette smoking habit among male in Karunagappally cohort according to occupation

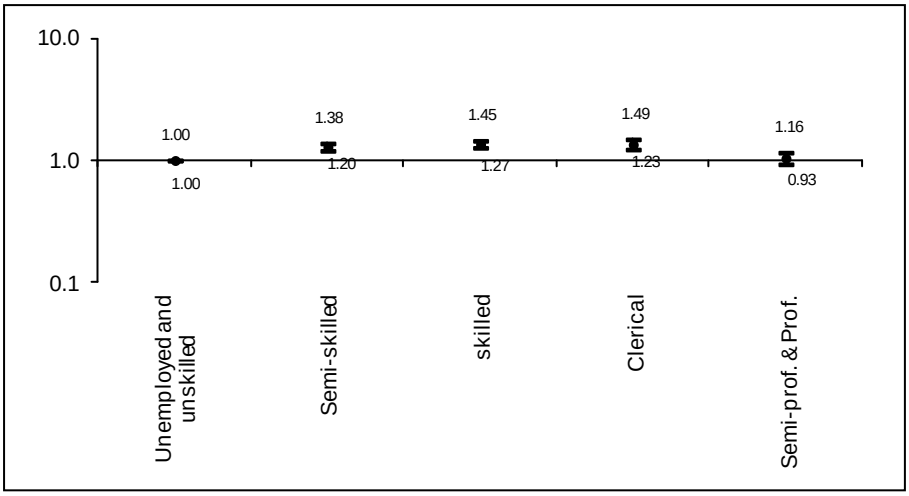


Fig. 21
Adjusted Odds Ratio and CI for combined smoking habit among male in Karunagappally cohort according to occupation

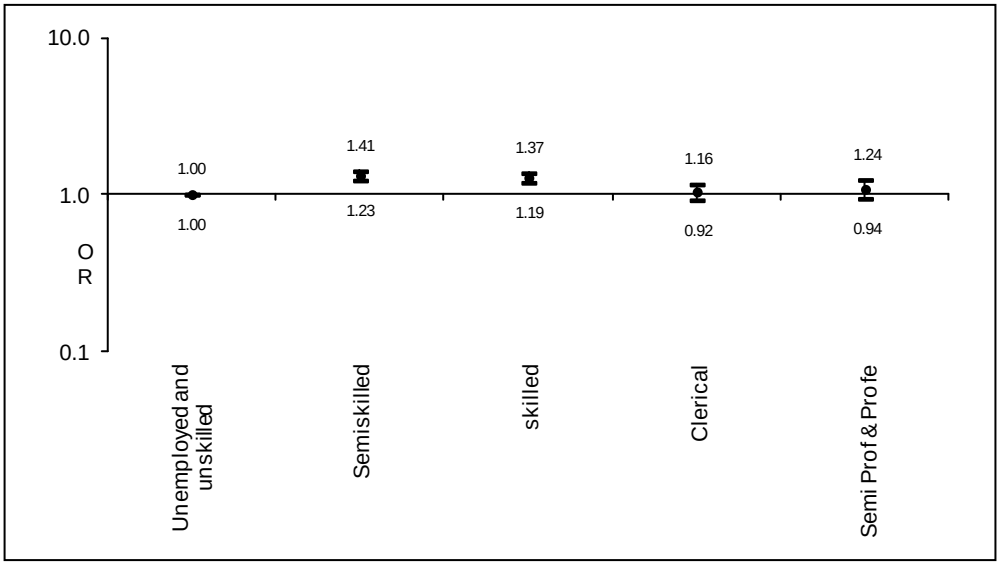


Fig. 22
Adjusted Odds Ratio and CI for smokeless tobacco habit among male in Karunagappally cohort according to occupation

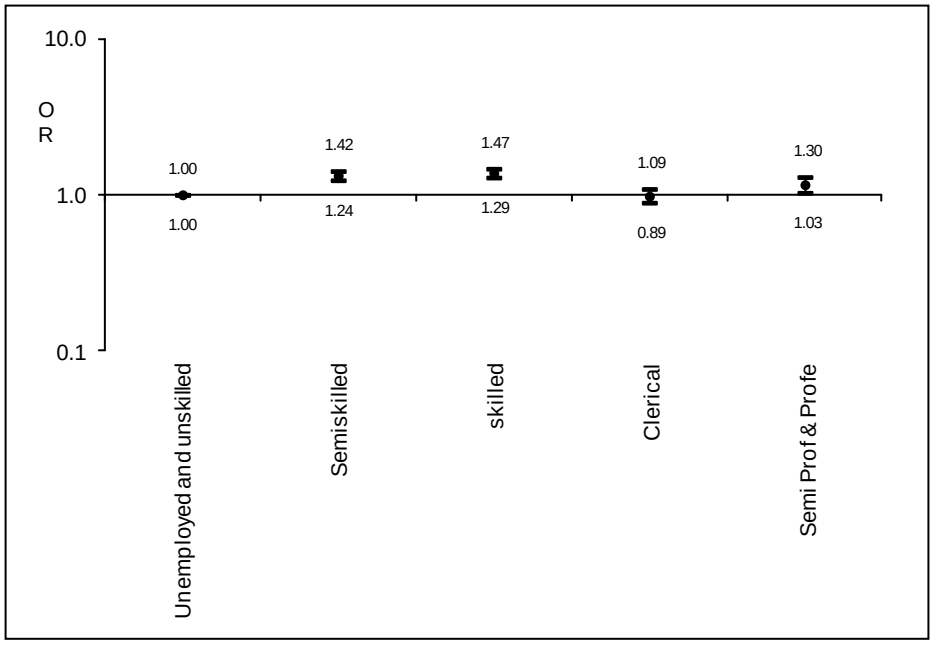


Fig. 23
Adjusted Odds Ratio and CI for bidi smoking habit among male in Karunagappally cohort according to Income

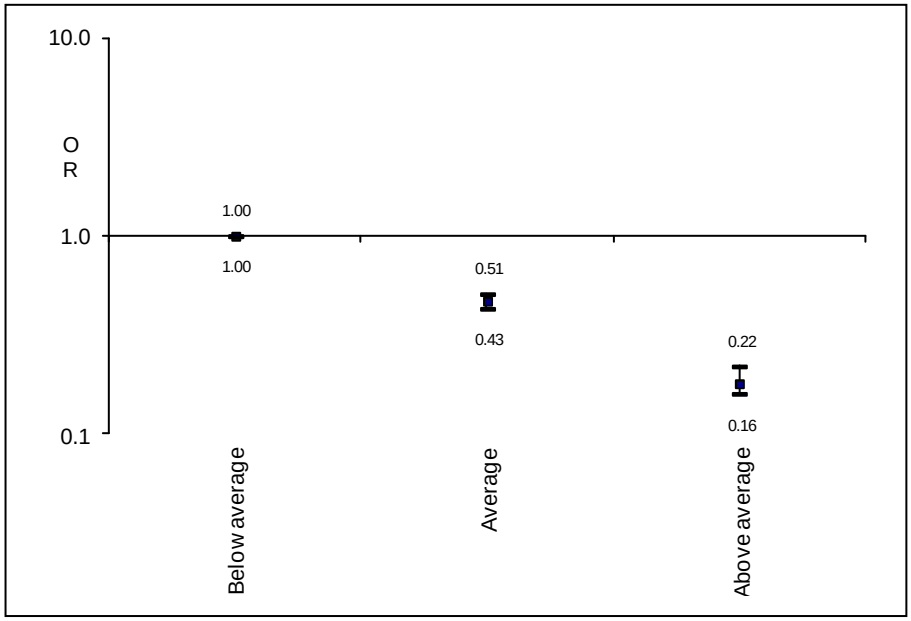


Fig. 24
Adjusted Odds Ratio and CI for cigarette smoking habit among male in Karunagappally cohort according to Income

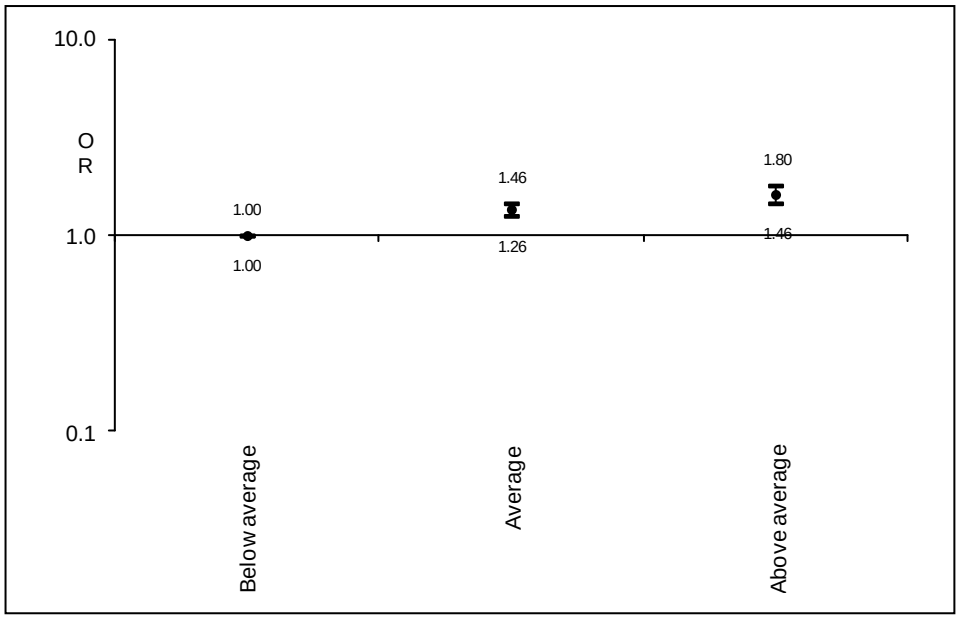


Fig. 25
Adjusted Odds Ratio and CI for combined smoking habit among male in Karunagappally cohort according to Income

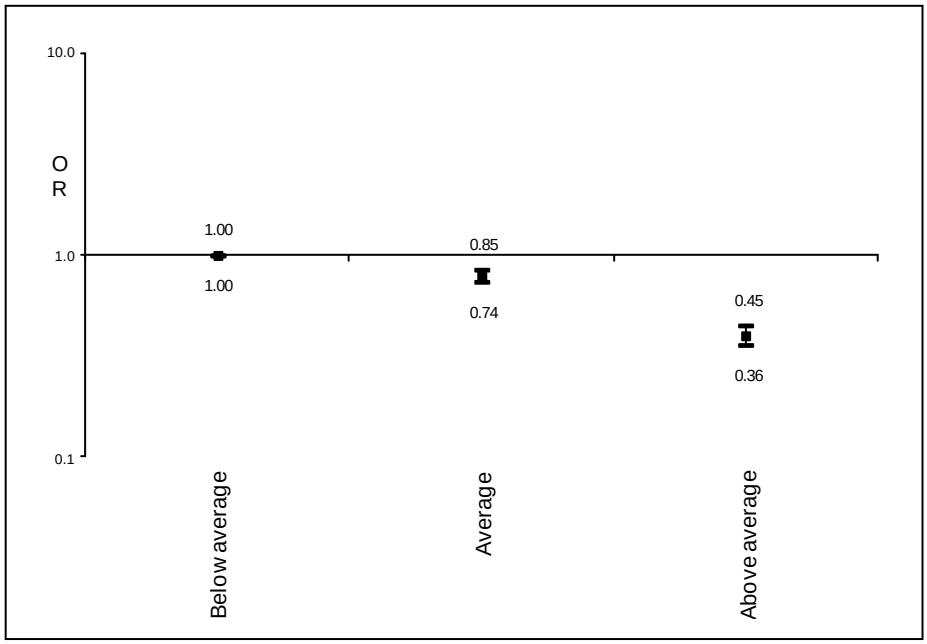
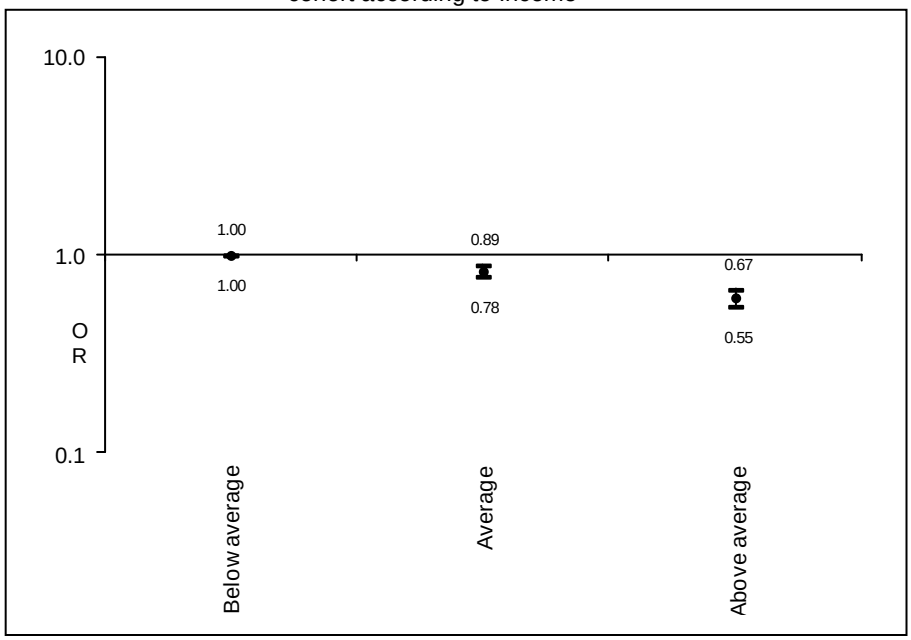


Fig. 26
Adjusted Odds Ratio and CI for smokeless tobacco habit among male in Karunagappally cohort according to Income



5.6 Association of tobacco use with alcohol consumption

Among those with the habit of alcohol use, the prevalence of having any of the tobacco habits was high compared to the non-users of alcohol. The bidi smoking habit was seven times higher among alcohol users than among the non-users. Similarly, the cigarette smoking habit was 13 times, the combined habit 17 times and the smokeless tobacco use habit 13 times more prevalent among alcohol users than among the non-users, after adjusting to all other factors.

In this study among women alcohol users, the bidi smoking habit was 328 times higher than among the non-users and as regards the smokeless tobacco use habit, it was 68 times higher (table 14).

Table 14
Crude and Adjusted OR for tobacco habit among both genders in Karunagappally cohort according to alcohol use

Tobacco habit	Crude OR	Adjusted OR	CI for Adjusted OR
Bidi - Men	12.03	7.01	6.53 – 7.73
Cigarette - Men	15.61	12.73	12.01 – 13.45
Combined - Men	24.76	18.67	17.53 – 19.89
Smokeless - Men	20.82	13.39	12.65 – 14.17
No use of any tobacco	**1**	**1**	**--**
Bidi - women	319.49	328.18	82.23 – 1309.79
Smokeless- women	38.48	67.68	21.25 – 215.53
No use of any tobacco	**1**	**1**	**--**

5.7 Population Attributable Risk of tobacco use accounted for by the determinants

Population Attributable Risk (PAR) will give the amount of effect that can be removed from the community if the factor associated with the effect is eliminated from the community. The determinants in this study were age, religion, marital status, education, occupation, income and use of alcohol. To calculate PAR each factor with a statistically significant correlation was divided into two categories and then the relative risk for each factor was calculated (table 15). The factors were grouped as modifiable and non-modifiable risk factors. The modifiable risk factors included were alcohol consumption, education, occupation and income and the non-modifiable risk factors included were age, religion and marital status. Clerical,

semi-professional and professional were included in the white collar employment categories, and unemployed, unskilled, semi-skilled and skilled were included in the blue collar category. The details of the categorization are given in table 15.

Table 15
Categorization of socio-demographic variables for PAR calculation in Karunagappally cohort

Factors	Category 1	Category 2
Age (for male)	<30 years	>=30 years
Age (for female)	<50 years	>=50 years
Religion	Hindu	Others
Marital status	Single	Married
Education	Middle and above	Primary or below
Occupation	White collar job	Blue collar job
Income	Average and above	Below average
Use of alcohol	Absent	Present

The prevalence of various types of tobacco habit among men and women with new categorization for PAR calculation is given in table 16 and 17.

Table 16

Prevalence of bidi only, cigarette only, combined smoking and smokeless tobacco use among men in Karunagappally cohort according to socio-demographic characteristics categorized for PAR calculation

Variables	Bidi alone		Cigarette alone		Combined		Smokeless	
	Number	%	Number	%	Number	%	Number	%
Age group in years								
<30	412	1.1	4570	12.5	2366	6.5	4208	11.5
>30	9338	16.59	9869	17.5	20453	36.4	19523	34.7
Religion								
Hindu	6957	10.8	10191	15.8	15966	24.7	18636	28.9
Others	2793	9.9	4248	15.0	6853	24.2	5095	18.0
Marital Status								
Single	483	1.4	3892	11.2	1706	4.9	3514	10.1
Married	9267	15.9	10547	18.2	21113	36.3	20217	34.8
Education								
Primary and below	5700	27.0	1949	9.2	8862	41.9	8001	37.9
Middle and above	4050	5.6	12490	17.4	13957	19.4	15730	21.9
Occupation								
Blue collar	9431	11.1	12308	14.5	21413	25.2	21870	25.7
White collar	308	4.0	2097	27.2	1363	17.7	1817	23.5
Income								
Below Average	5030	18.4	1853	8.3	7800	34.9	7392	33.0
Average and above	4709	7.2	12552	19.2	14976	22.8	16295	24.9
Total	**9750**	**10.5**	**14439**	**15.5**	**22819**	**24.6**	**23731**	**25.5**

Table 17

Prevalence of bidi only and smokeless tobacco use among women in Karunagappally cohort according to socio-demographic characteristics categorized for PAR calculation

Variables	Bidi		Smokeless	
	Number	%	Number	%
Age				
<50	104	0.1	5214	6.2
50+	1042	3.7	12060	42.8
Religion				
Hindu	646	0.8	12643	16.5
Others	500	1.4	4631	12.9
Marital status				
Single	16	0.1	245	1.0
Married	1130	1.3	17029	19.4
Education				
Below primary	1047	3.0	12955	37.0
Above primary	99	0.1	4319	5.6
Occupation				
Blue collar	1133	1.0	17146	15.8
Others	12	0.2	111	3.1
Income				
Below average	868	2.5	10814	31.2
Above average	277	0.4	6443	8.3
Total	1146		17274	

Using the above categorization, logistic regression was applied to find OR and its significance. The result shows that all the ORs are statistically significant. The adjusted OR for different types of tobacco habit is given in table 18.

Table 18
Odds Ratio for different habits according to socio-demographic factors in Karunagappally cohort among both genders

Factors	Men				Women	
	Bidi	Cigarette	Combined	Smokeless	Bidi	Smokeless
Age	9.55	1.58	3.71	2.47	17.01	4.74
Marital Status	5.89	3.85	8.94	5.31	2.93	8.27
Religion	0.78	0.87	0.87	0.55	1.61	0.71
Education	3.84	0.96*	2.03	2.08	6.78	3.56
Occupation	1.40	1.13	1.29	1.29	1.05*	0.96*
Income	4.66	0.84	2.90	1.76	7.18	4.00
Alcohol	12.03	15.61	24.76	20.82	319.49	38.48

*Not significant

Table 19
PAR for different factors in different habituees in Karunagappally cohort among both genders

Factors	Men				Women	
	Bidi	Cigarette	Combined	Smokeless	Bidi	Smokeless
Age	85.86	29.17	64.80	51.07	92.02	72.92
Marital Status	75.35	64.14	83.22	72.93	53.07	80.99
Occupation	22.98	8.84	17.78	17.78	4.61	--
Religion	--	--	--	--	15.69	--
Education	39.30	--	19.01	19.76	64.33	44.41
Income	72.13	--	57.32	34.95	81.33	67.90
Alcohol	78.18	82.60	88.53	86.56	24.16	3.60

Blank space, not calculated, because the OR showed not risk factor

Using the OR given in table 18 and the prevalence of the risk factors shown in table 17, the PAR for each factor was calculated, the details of which are given in table 19. Education, income and alcohol consumption were the modifiable factors observed in the study. The modifiable factors in this study were significant risk factors in almost all types of tobacco habit except in the cigarette smoking.

With regard to education, 39.3% bidi smoking habit, 19% combined smoking habit and 19.8% smokeless tobacco habit could be attributed to the education level which was below or equal to the primary. Among women, 64% bidi smoking habit and 44.4% smokeless tobacco use could be attributed to the level of education below or equal to the primary.

The proportion of bidi smoking habit among the men in the study population that could be attributed to consumption of alcohol was 78.2%, cigarette smoking 82.6%, combined smoking 88.5% and smokeless tobacco use 86.6%. Among women, the proportion of bidi smoking habit attributable to consumption of alcohol was 24.2% and for smokeless tobacco was 3.6%.

With regard to the income of the male subjects in the present study, 72.1% bidi smoking, 57.3% combined smoking and 35% smokeless tobacco use could be attributed to an income level below average. The study revealed that among women, too, 81% bidi smoking and 67.9% smokeless tobacco use were attributed to the income level of below average.

6. DISCUSSION

The objectives of this study were to find the prevalence of different tobacco habits and their determinants in a rural population in South India. The history of tobacco use and the forms of use from smokeless to homemade and the manufactured cigarettes is variable. The habits in the USA and Europe cannot be compared with those in India.

In the Western countries smoking of cigarette is the most common form of tobacco use. In India this habit is relatively rare, and the most common form of smoking is bidi, a handmade local form of tobacco. Smokeless tobacco is also common, especially among women.

In the review and in the discussion, the present study compared its results with those of others on socio-demographic determinants of tobacco use, with a focus on India and other South East Asian countries. The references made were mainly on studies from countries that spanned from Pakistan in the West to New Zealand in the East. The latter country additionally has a high standard of living, with a life style relatively similar to that in the North America and most of Europe.

6.1 Socio-demographic determinants of tobacco use

Tobacco habituees in the study area were of two types, tobacco smoking and tobacco chewing. The tobacco smoking habit was further grouped into three categories, which comprised bidi smoking, cigarette smoking and combined (both bidi and cigarette) smoking. Smoking tobacco use was more common among men and smokeless tobacco use more common among women. In parts of India beyond Kerala, many other forms of tobacco use like cheroots, chuttas, dhumti, hooklis, chillum, hookah are prevalent (Reddy and Gupta 2004), but none of the participants in the present study reported the use of these types of tobacco products.

6.1.1 Gender as determinant of tobacco use

In the present study, prevalence of any form of tobacco habit was 57% among men and 16% among women. Among men smoking was more common (51%) than smokeless tobacco use (26%). In women, the prevalence of smokeless tobacco use was 15%). Only 1% of women reported to have the habit of tobacco smoking, and bidi smoking was the prevailing habit, with only 0.1% being cigarette smokers.

Among men in the age group of 15 years and above the prevalence of current smoking in Kerala was 28% and among women 0.4%. With regard to smokeless tobacco, the prevalence was 9% among men and 10% among women (IIPS 2001). A community-based study conducted in Kerala showed that 72% of men and 6% of women ever used tobacco (Pradeepkumar et al. 2005).

In other studies, too, from India, the pattern of tobacco use was found to be different among men and women. In Mumbai, India, among men, 41% were ever users of tobacco while among women the proportion was 26%. The smoking prevalence rates were 27% among men and less than 0.5% among women. Among men 12% were cigarette smokers and 15% were bidi smokers. (Sorenson et al. 2005). Data from the National Sample Survey revealed that men were 25.5 times more likely to smoke than women and 3.7 times more likely to use smokeless tobacco (Neufeld et al.2005).

Smokeless tobacco and bidis were commonly used in India and Bangladesh, and smokers mostly favoured manufactured cigarettes. Women started smoking at an older age than men. (Giovino et al. 2012). A study in Mizoram, India showed that all types of tobacco use was 56% and 45% respectively among men and women above the age of 10 years. The prevalence of smoking among men was 42% and smokeless tobacco use among women was 27% (Chaturvedi et al. 1998). In Gujarat, the overall current prevalence of tobacco use in different forms was 48% in the total population. The prevalence was 62% in men and 26% in women. Among the male tobacco users, 81% were tobacco smoking habituees and among women tobacco users 39% used the snuff form of tobacco (Bala et al. 2006).

A study by the National Family Health Survey (NFH) 1998-99 showed that the overall tobacco prevalence was 47% among men and 14% among women (Rani et al. 2003). A study in India by the National Sample Survey revealed that the national prevalence of regular use of smoking tobacco and smokeless tobacco was 16% and 14% respectively among those above the age of 10 years (Neufeld et al. 2005).

The National Household Survey 2000 of Belarus estimated that on an overall basis 41% of the population has ever smoked, 29% were current smokers and 12% ex-smokers. 53% of men and 9% of women were current smokers (Gilmore et al. 2001). A study in West Virginia showed that among the youth 31.8% were current tobacco smokers and 16.1% current smokeless tobacco users. Among students who were currently smokeless tobacco users, 63.2% were also current smokers (Horn et al. 2000). The prevalence of tobacco smoking in the US has declined marginally but the prevalence of smokeless tobacco use has increased (Rodu and Cole 2009).

In the present study the prevalence among men was 51% and 26% for smoking and for smokeless tobacco use among men respectively. These figures show that the prevalence of tobacco use in the current study is more frequent than in other areas surveyed by NFH and the northern states of India. But among women the prevalence was comparable to the NFH study data but was less frequent than the findings from Mizoram. The lowest prevalence was reported in the national sample survey by Neufeld et al. The true difference between this study and study by Neufeld et al. is probably even larger because the latter studied only those above the age of 10 years (Neufeld et al. 2005). The smaller prevalence of women with the tobacco habit in the present study may be associated with the relatively high standard of living in Kerala, which may also be related to its high literacy rate of 88% (Census of India 2001).

In a study conducted in New Delhi it was observed that 45% of men and 7% of women aged 25-64 years were smokers, and among the smokers 53% of men and 5% of women smoked only cigarettes while others smoked bidi or chutta (Narayan et al 1996). Gupta et al. (1996) reported that smokeless tobacco use was highly (58%) prevalent among women in Mumbai. Among men, 69% were current tobacco users, of whom 24% were smokers. The most common smokeless tobacco practice among women was mishri use (44% of smokeless users) and among men the practice was betel quid with tobacco (27%). About half of the smokers used bidi and other half smoked cigarettes (Gupta 1996a). A male predominance in smoking was observed in a study in four different centers in India ((Jindal et al. 2006). In this study the national prevalence observed was 28% among men and 2% among women. The study also reported that in Chandigarh the prevalence among men was 30% and among women 3%. In Delhi the prevalence reported was 30% and 4% respectively. In Kanpur, the smoking prevalence among men was 22% and among women 1%. But in Bangalore while the male smoking prevalence was 28% none of the women was reported to have the habit of tobacco smoking. Bidi was the commonest item used for smoking (Jindal et al. 2006). In Uttar Pradesh the overall prevalence of smoking was 59% and chewing was 74%. The major consumption of smoking tobacco was cigarette and bidi. Tobacco-betel and khaini

were the common smokeless tobacco used. Tobacco along with alcohol was consumed by 19% (Kumar et al. 2006). The present study also showed a male predominance in tobacco smoking. The practice of chewing tobacco with betel was more common than other forms of tobacco use. Bhonsle et al. reported that among men, the prevalence of bidi smoking habit was higher in Kerala than in Gujarat, Andhra Pradesh, Bihar and Goa, and among women the bidi smoking habit is more frequently practised in Bihar and Goa than in Kerala and Andhra Pradesh (Bhonsle et al. 1990).

A nationwide cross-sectional study conducted in Pakistan revealed that the overall prevalence of smoking was 15% (29% among men and 3% among women) (Ahmad et al. 2005). The prevalence of tobacco smoking in other South Asian countries is given in table 20. The data show that the lowest smoking prevalence among men existed in Sri Lanka and the highest in Bangladesh. India had the lowest and Nepal the highest prevalence of tobacco smoking among women. As per World Bank report 2000, the smoking prevalence in South Asia is 32% among men and 6% among women. The overall rate was 21% (World Bank 1999). In Southeast Asia, as per Tobacco Atlas 2002, Cambodia had the highest male tobacco smoking prevalence and Papua New Guinea the highest female prevalence. Yet, a study in Vietnam revealed that the smoking prevalence among men was 73% and among women 4% (Jenkins et al. 1997), which was higher than the rate in Cambodia.

A cross-sectional study conducted among Omani adults showed a crude prevalence of current smoking of 13% in men and 0.5% in women (Al Rivami and Afifi 2004). A similar study in Kuwait revealed that the prevalence of smoking was 34% among men and 2% among women (Memon et al. 2000). As per the report of Tobacco Atlas 2002, the highest prevalence of smoking among men was reported form Georgia (61%) and the highest prevalence among women from Lebanon (35%) (table 20).

In East Asia, Mongolia reported the highest prevalence of smoking among men and women (table 20). In a study in Taiwan it was observed that there was a high smoking prevalence among men compared to women. Males smokers smoked on an average 17 cigarettes per day and women, 11cigarettes per day (Wen et al. 2005). A study in China among people aged 15-69 years showed that 34% of the population smoked at least one cigarette daily. In the same study it was seen that current smoking was more prevalent among men, 63% higher than in women, 4% (Yang et al. 1999). In another study in China, among persons above 15 years of age, it was observed that the prevalence of smoking was 67% among men and 2% among women (Gong et al. 1995). China had a prevalence rate of 4% for cigarette smoking among women aged 25 years or younger (Lau et al. 2003). In the present study, too, the smoking habit was more prevalent among men than in women. The

prevalence of the habit of smoking among women observed in the present study was less than 1%. This may be associated with the high female literacy rate.

The tobacco smoking habit among males in most of the European countries is low: Austria 21%, Denmark 32%, Finland 27%, Norway 31%, Sweden 19%, France 38%, Germany 39% and UK 27%. However, in the case of women, the prevalence of the smoking habit is higher in the European countries than in the Asian countries: France 30%, Germany 31%, Norway 32% and UK 26% (Mackay J and Eriken M, 2002).

Data from GATS in 2008–2010 from 14 low- and middle-income countries which include Bangladesh, Brazil, China, Egypt, India, Mexico, Philippines, Poland, Russia, Thailand, Turkey, Ukraine, Uruguay, and Vietnam revealed that in the reproductive age group the prevalence of tobacco smoking habit ranged from 0.4% to 30.8%. The smokeless tobacco prevalence was 20.1% in Bangladesh and 14.9% in India (Caixeta et al. 2012). The habit of smokeless tobacco use is very common in Karunagapply taluk.

Table 20
Prevalence (%) of adult tobacco smoking in Asian Countries
(Mackay J and Eriken M, 2002)

Country	Men	Women
South Asia		
Bangladesh	54	24
India	29	2
Maldives	37	15
Nepal	48	29
Pakistan	36	9
Sri Lanka	26	2
Southeast Asia		
Brunei Darussalam	40	14
Cambodia	66	8
Indonesia	59	4
Malaysia	49	4
Papua New Guinea	46	28
Philippines	54	11
Singapore	27	3
Thailand	44	3
Vietnam	51	4
West Asia		
Armenia	64	1
Azerbaijan	30	1
Bahrain	24	6
Cyprus	38	8
Georgia	61	15
Iran	27	3
Iraq	40	5
Israel	33	24
Jordan	48	10
Kuwait	30	2
Lebanon	46	35
Oman	16	2
Qatar	37	0.5
Saudi Arabia	22	1
Syria	51	10
United Arab Emirates	18	<1
Yemen	60	29

Table 20 continued
Prevalence (%) of adult tobacco smoking in Asian Countries
(Mackay J and Eriken M, 2002)

Country	Men	Women
East Asia		
China	67	4
Japan	53	13
Mongolia	68	26
Central Asia		
Kazakhstan	60	7
Kyrgyzstan	60	16
Turkmenistan	27	1
Uzbekistan	49	9

6.1.2 Age as determinant of tobacco use

It was observed in the present study that the prevalence of cigarette smoking among men was 23% in the age group of between 30-39 years. The prevalence then showed a decrease. As age increased the prevalence of bidi smoking habits also increased. Among men aged less than 30 years the prevalence of bidi smoking was 1% while it increased to 27% in the age of above 50 years. Among women too, the prevalence of bidi smoking habit increased as age increased. As age increased, combined smoking habit too increased, therefore, following the pattern of cigarette smoking. Among both men and women, the smokeless tobacco habit was also found to increase as age increased.

A study conducted in Gujarat revealed that tobacco use in the community increased with increasing age (Bala et al. 2006). It was also observed in a study carried out at four different centres in India that the prevalence of tobacco habit increased as age increased (Jindal et al. 2006). A study from Mizoram, India reported that age had a significant association with tobacco use (Chaturvedi et al. 1998). The National Sample Survey conducted in India in 1995 showed an association between regular tobacco use and age (Neufeld et al. 2005). The National Family Health Survey of India revealed that the prevalence of tobacco consumption increased up to the age of 50 years and then leveled or declined (Rani et al. 2003). Jindal et al. reported that bidi smoking and cigarette smoking habits increased with age. This observation was true for both men and women (Jindal et al. 2006).

In a nationwide cross-sectional study conducted in Pakistan it was reported that age was an independent predictor for tobacco use (Ahmad et al. 2005). The study also showed that the highest prevalence of tobacco use, 41%, was among men aged 40-49 years (Ahmad et al. 2005). Ali and co-workers in another study conducted in Pakistan reported that the prevalence of tobacco habit increased with age and was the highest among subjects aged 44 years and above, with the proportion of tobacco users being 76% (Ali et al. 2006).

Palipudi et al. reported that in almost all low and middle income countries, as age increased the prevalence of any tobacco habit, too, increased. In India, the prevalence was 18.4% in the 15-24 year age group and 49.4% in the 55-64 year age group. The OR reached 4.88 in the age group 55-64 years compared to the 15-24 years (Palipudi 2012).

A report from Bangladesh showed that tobacco prevalence was almost nil in teenage men and women. However, more than one third of the men and the women in the age group 20-34 had the habit of tobacco use. Yet, for women in the same age group, the prevalence was only 16%. This trend continues and in the later years of age it reached 73% and 59% for men and women respectively (Yunus 2001).

Wen and co-workers observed in a study from Taiwan that smoking prevalence of men and women substantially increased during and after the high school years and peaked in the age group 30-39 years (Wen et al. 2005). A study in Oman showed that the highest prevalence of current smoking was observed in those between 40-49 years of age, the prevalence being 18.7% among men and 0.9% among women respectively. The major form of tobacco used was cigarettes. Other forms used were shisha, gadou and chewing tobacco (Al Rivami and Afifi 2004). In a study in Kuwait it was observed that among men, the highest prevalence of cigarette smoking habit existed in the youngest age group, of less than 21 years, and among women the highest prevalence of cigarette smoking was observed in the older age groups (Memon et al. 2000). In China, 3% of women aged 46-65 years and 2% of women aged 65 years or older were habituees of cigarette smoking (Lau et al. 2003).

It is reported in most studies that there existed an increasing trend of tobacco habit with increasing age, which is in accordance with the results observed in the present study. In the latter, however, tobacco was used in different ways, with bidi smoking being a common habit of women and older men. Smoking of cigarettes is likely to become the prevailing form for tobacco use because the proportion engaged in tobacco use in this form among the younger men is already substantial.

6.1.3 Religion as determinant of tobacco use

The population of Kerala is one of the most secular in India. There are three major religions in Kerala. According to the 2001 census, 56.2% of the total population were Hindus, 19% Christians and 25% Muslims. Among the subjects in the present study there were 69% Hindus, 7% Christians and 24% Muslims. When the whole of Kerala was considered, the proportion of Hindus as compared to Christians in the study area was high. This finding may be due to the fact that people who profess a specific faith tend to be clustered in some areas in Kerala.

It was also observed from the study that religion had a role in different types of tobacco habits among both men and women. In men, the prevalence of bidi smoking was high among the Hindus and Muslims, and as regards cigarette smoking, no such difference was observed. The combined smoking habit was common in those of the Christian faith compared to the other two religious groups. Smokeless tobacco use was more common among the Hindu religious group than in the other two religious groups. Among women the use of smokeless tobacco was more prevalent among the Hindus whereas bidi smoking was more prevalent among the Muslims. A study among college students in Bangalore, India showed that Christian youth were 1.57 times more likely to have tried tobacco products such as cigarette and bidi than the Hindu youth (Yunus 2001). In India, tobacco use is not considered as immoral or sinful, especially among the religious groups studied in Kerala. Compared to other determinants investigated in the present study, religion does not appear to play a major role in taking up to the smoking habit or continuing with it.

6.1.4 Marital status as determinant of tobacco use

The participants in the present study were categorized into single and married. Among men, the prevalence of the overall habit was less common among the single than among the married. The prevalence of cigarette smoking was higher in the married than among the single. The prevalence of smokeless tobacco habit, too, was more common among married men than among the single. Among women, the prevalence of both bidi smoking and smokeless tobacco use was higher among the married than among the single.

In a study in Delhi in India it was reported that people smoking bidi or chutta were mostly married whereas the cigarette smokers were mostly single (Narayan et al. 1996). The study by Yunus in Bangladesh revealed a difference in tobacco prevalence among the married and the single. Among the single, the prevalence observedwas low and among the married the prevalence was very high. The highest

prevalence was observed among the group classified as widow/widower (Yunus 2001). A study among Chinese women showed that being divorced and having had a husband who smoked was a significant risk factor for cigarette smoking (Lau et al. 2003). Spangler et al. reported that tobacco use was associated with marital status among women (Spangler et al. 1997). The results are quite similar to the results of the present study. A study in Vienna showed that the higher likelihood of smoking that existed among married men may be due to the stressful influence of multiple responsibilities. Besides, the higher likelihood of smoking among ever married women can be related to the negative influence of stress (Flandorfer et al. 2010).

6.1.5 Education as determinant of tobacco use

The 2001 census of India showed that the literacy rate of Kerala was 92% with the male literacy being 94% and the female literacy 88% (Census of India 2001). Only 0.6% of the subjects in the present study were observed to be illiterate. Therefore, the illiterate were combined with the literate that had only received informal education. Among men, the prevalence of tobacco use was higher among those with education below high school level than those educated up to high school or college level. The differences were large in those with combined or bidi only smoking habit. All women who had the habit of bidi smoking had received education below the high school level. Among women with informal education 45.4% were smokeless tobacco users. The prevalence of smokeless tobacco habit decreased as the educational status increased.

A study in Gujarat, India showed that the prevalence of tobacco use was high in the illiterate and low in the literates and that the habit decreased significantly as education increased (Bala et al. 2006). Another study conducted in Kerala, showed that compared to men with more than 12 years of schooling, those with less than five years of schooling were seven times more likely to smoke (Pradeepkumar et al. 2005). Additionally, another study in India observed that the educational level was inversely associated with the use tobacco of all kinds except for cigarette smoking (Gupta et al. 1996b). In a study conducted in New Delhi it was reported that education was the strongest predictor of smoking when compared to other determinants such as marital status, religion and occupation. Men without education were 1.8 times more and women without education were 3.7 times more likely to be smokers than those with college education (Narayan et al. 1996). Rani et al. had reported that tobacco consumption was significantly high in the poor and the less educated (Rani et al. 2003). Another study showed an inverse association between educational status and tobacco use. The greatest tobacco consumption in

men was observed among the illiterates and the low educational status subjects as compared to the more literate as well as women (Gupta 2006). Among men, smoking, chewing and dual use of tobacco increased as the level of education decreased. While the use of smokeless tobacco in the group educated up to postgraduate level was 18.5%, in the illiterate it increased to 47.1%. The prevalence was higher in the socio-economically disadvantaged groups such as the less educated and the poor (Bhan et al. 2012). However, another study reported that the influence of education on tobacco use was minimal (Chaturvedi et al. 1998).

A study in Uttar Pradesh, India showed that the use of smoked and non-smoked tobacco in both men and women was associated with the socio-economic status and education (Dixit et al. 2012). Tobacco use was inversely related to the education level across all types of tobacco consumption. The magnitudes of the odds ratios were especially large among those with no more than a primary education (Sorensen et al. 2005). A study in Mumbai revealed that compared to the college educated, illiterates had a higher risk of developing the tobacco habit. The OR of overall tobacco use was 7 and 20 in men and women respectively (Sorensen et al. 2005). A multilevel national survey in India showed that individuals with no education were three times more likely to smoke and chew tobacco than those with postgraduate education (Subramanian et al. 2004).

Literacy was found to be a significant determinant of smoking in Pakistan (Ahmad et al. 2005). Yunus reported that in Bangladesh, the prevalence of tobacco use was highest among the illiterate irrespective of the gender. More than three-fourths of the illiterate men and 40% of illiterate women had the habit of tobacco use (Yunus 2001).

The study in Oman showed that higher educational level was associated with tobacco smoking (Al Rivami and Afifi 2004). A study among Chinese women revealed that below the level of university education was a significant risk factor for cigarette smoking (Lau et al. 2003). The amount smoked in the less educated smokers was twice that in the well educated smokers (Wen et al. 2005).

In the Western countries, too, education has been shown to be associated with tobacco use. A study conducted by Osler et al. in Denmark to assess the association between smoking and various socio-economic indicators showed that current smoking was related to the number of years of school education. The prevalence of current smoking was highest among the least educated (Osler et al. 2001). A study by Shohaimi et al. in the UK also showed that the educational level was independently related to the cigarette smoking habit among both men and women (Shohaimi et al. 2003). Fernandez et al. in Spain observed that among men and women aged 25 years and above, men with highest educational level tended to have a lower probability of being smokers at a given age than those with education below primary school level (relative risk = 0.6). Among the women, however, the

reverse relationship was observed: the higher the level of education the higher the relative risk of starting smoking (relative risk = 5) (Fernandez et al. 2001). Data from the 2000 National Health Interview in USA also showed that low educational level was associated with current smoking (Barbeau et al. 2004).

Low level of education is one of the strongest determinants for the use of tobacco. Cigarette consumption but also the use of handmade local forms of tobacco was reported to be education-dependent. Our study is consistent with the evidence that the highly educated first give up the traditional habits and adopt the practices of the West such as smoking cigarettes.

In the present study the prevalence of the use of domestic forms of tobacco was 4 to 8 times in men and even higher in women between the lowest and the highest educational classes. These values are clearly higher than those reported in most other studies, and emphasize the potential benefits of tobacco control by means of general education.

6.1.6 Occupation as determinant of tobacco use

In our study the occupation was divided into five categories which comprised unemployed and unskilled workers, semi-skilled workers, clerical workers, semi-professionals and professionals. 43% of the men and 62% women were unskilled workers.

Among the unskilled men, and the semi-skilled men there was a higher prevalence of the bidi smoking habit than in the other occupational categories. With regard to cigarette smoking, the prevalence was lower in this group than in the other occupational categories. The prevalence of combined smoking habit was highest in the semi-skilled workers. The bidi smoking habit did not exist among women in the semi-professional and professional categories. The prevalence of smokeless tobacco use was the lowest among women in the professional occupational group and the highest among the semi-skilled and the unskilled occupational groups.

Another study on occupation had shown that in India, men in the agriculture and the labour class had the highest prevalence of tobacco use than in any other occupational group (Bala et al. 2006). A study in Mumbai showed that occupation was found to be a significant risk factor for developing tobacco habit after adjusting for age and education. Among men as well as in women, professionals were least likely to have ever used tobacco, whereas unskilled workers and the unemployed individuals were most likely to have done so. The highest prevalence of smokeless tobacco use was observed among unskilled workers and the unemployed. Smokeless tobacco use was more prevalent among the service and the

unskilled workers and the unemployed individuals among men. Bidi smoking among men was high in the unemployed individuals and the unskilled workers. In contrast, cigarette smoking was most common among professionals and traders. The study concluded that occupation had important simultaneous and independent relationships with tobacco use that required attention from policy makers and researchers alike (Sorensen et al. 2005). Another study, too, revealed that the type of occupation had a significant association with tobacco use (Chaturvedi et al. 1998). Other studies from India also showed an association between tobacco use and the type of occupation (Narayan et al. 1996, Osler et al. 2001).

Yunus in Bangladesh reported that in those who were engaged in agricultural and labour work the prevalence of tobacco use was higher than in the other groups (Yunus 2001). A study from Kuwait revealed that factors associated with the smoking habit also included lower employment grade (OR=4) (Memon et al. 2000). A study in New Zealand showed that occupation and income were determinants for the tobacco habit (Whitlock et al. 1997).

Much of the differences between occupational categories can be accounted for by education (Shohaimi et al. 2003). Additionally in India education was the most sensitive of the SES components to pin point the risk of tobacco use. However, in a country with large socio-economic differences in education, occupation and unemployment are highly interlinked and SES is more as a totality without well defined component like education or occupation.

The high level of smoking in the lower socio-economic group may be attributable to many factors such as parental smoking, social environment, economic insecurity, loneliness and stress, poor psychosocial and physical health, self esteem etc. (Jarvis and Wardle 1999, Richardson 2001).

6.1.7 Income as determinant of tobacco use

In this study the prevalence of bidi smoking among men was associated with low income. Also, the prevalence of combined tobacco habit was less prevalent in the high-income group, although it was not true with respect to cigarette smoking. Among women, too, there was an inverse association observed between the prevalence of tobacco use and income. Education, occupation and income are indicators of socio-economic status.

Jindal and co-workers reported that low socio-economic status and rural residence were important factors associated with smoking (Jindal et al. 2006). The socio-economic differences were more marked for smoking than for smokeless tobacco use (Subramanian et al. 2004). Individuals with an income below the poverty line had high relative odds for use of chewing tobacco compared to those

above the poverty line but no association had been found between regular smoking and the degree of poverty (Neufeld et al. 2005).

The prevalence of smoking among both men and women in Pakistan increased with income (Ali et al. 2006), which was not in accordance with the findings in the present study in the context of cigarette smoking. Another study in Pakistan showed that the prevalence of tobacco use was inversely related to income (Alam et al. 2008). A study in Bangladesh had shown that there was no specific relation with regard to the level of monthly income and the prevalence of tobacco use (Yunus 2001).

In a study conducted in Taiwan it was reported that smokers from the low-income group smoked at nearly twice the rate of those in the high-income group (Wen et al. 2005). A study conducted among New Zealanders showed that individuals of low socio-economic status consumed a disproportionately large amount of tobacco (Whitlock et al. 1997).

Income is considered as one of the factors for assessing socio-economic status. The observations in this study revealed that the socio-economic status was related to tobacco habit among women. Tobacco smoking is clearly related to economic transition. Domestic products were predominant in India in the past but they had been gradually replaced with cigarettes, with the change taking place first in the well to do segment of the population. This transition results in problems but also potentials on tobacco control and it links with broader general policies (of agriculture, taxation, etc.). The cost of tobacco products is directly associated with type of tobacco habit. Those with low income are more prone to use low cost products such as bidi and smokeless tobacco compared to those with high income as the latter can afford to buy the costly tobacco products such as cigarettes.

6.2 Alcohol consumption as determinant of tobacco use

The participants in the present study were categorized as alcohol users and non-users. Among men, the prevalence of any type of tobacco use was much higher among those who had the habit of alcohol use than among those who were non-users of alcohol. The difference that was observed in women was even greater. This was, however, mainly due to the rare use of alcohol in women.

A study among medical students in India revealed that the prevalence of tobacco use was associated with the habit of alcohol use, with 88% tobacco users being alcohol habituees whereas among those who did not use tobacco the prevalence was 12% (Singh et al. 2003). In the case of male alcohol users, it was observed that bidi smoking habit was four times and cigarette smoking was seven

times higher than among alcohol non-users. In a study in Thailand it was reported that the strongest predictor of smoking was alcohol use in both sexes (Aekplakorn et al. 2008).

The causal pathway is not clear with the tobacco-alcohol relationship. Spangler et al. observed that alcohol consumption was a significant factor for developing the tobacco habit (Spangler et al. 1997). It is likely that many common environmental circumstances are risk factors to the initiation of both the use of tobacco and of alcoholic beverages. The odds ratios from 12 to 320 depending on tobacco form and sex in this study indicate a very close association between these two habits. The correlation was higher than in other studies and provides a potential means of prevention in rural Kerala and in other similar populations. It is likely that success in the control of one would result in a positive effect on the other as well.

6.3 Determinants amenable for preventive action

To determine the degree of association between bidi, cigarette, combined and smokeless tobacco habit with the socio-demographic variables, univariate and multivariate logistic regression were performed. In simple binary logistic regression, the summary statistics (crude OR) will not consider the effect of confounding variables. The prevalence of all types of tobacco habits among men and women varies with age, education, occupation, religion, income and marital status. All types of tobacco smoking were more common in men than in women. The adjusted OR was taken to obtain a reliable estimate of population attributable risk (PAR), which gave the net effect of each factor. The PAR observed in this study was the net effect of the role of each factor on the prevention of tobacco use in the community.

The PAR for all the determinants identified can be grouped as modifiable and non-modifiable risk factors. We propose the modifiable risk factors included education, occupation, income and alcohol use. In the non-modifiable risk factors group we propose age, religion and marital status be included. Among the modifiable risk factors alcohol was the factor most closely related to tobacco use followed by occupation, education and income among men. But among women, the occupation and education were the most important determinants observed. Additionally, the occupation played a vital role in the tobacco habit. Blue collar workers were more prone to use tobacco than white collar workers. As far as education is concerned, if the level of education of the population is raised the consumption of all types of tobacco except cigarette smoking, is expected to get reduced. If the education of the male population can be raised above primary level, 30% of bidi smoking, 17% of combined smoking and 6% of smokeless tobacco

may be eliminated from the population. If women are given education 74% of the bidi smoking and 54% of the smokeless tobacco habit in them may be eliminated from the community.

For the calculation of PAR, the variables were dichotomized. Most of the risk factors observed in the study showed either an increasing or decreasing trend. This finding will help the policy makers to develop feasible preventive strategies and implement them in an effective manner.

6.4 Strengths and limitations of this study

It is important to note the strengths and limitations of any study. One of the important strengths of this study is that it is not a sample study, but a population study in one of the taluks in Kerala, India. Thus there was no selection bias in choosing the subjects to be included in the study.

Other important strengths include the large sample size, religious diversity and the inclusion of all socio-economic groups. Another important aspect is that the study area is recognised as a rural area and the large population studied is significant. The study of shifts of habits over time becomes feasible in such a region.

The investigators were able to estimate the population of the area by considering the census of India 1981. Trained enumerators did the collection of data from the study setting. The reliability of the data was checked by supervisors in the community. Ten per cent of the data was rechecked to assess the reliability.

The instrument used for collection of data was a validated tool, which made the data valid. The data were entered in dBase, using a special programme designed for the data entry. To check for reliability, double entry method was done on 10% of the total data entered. There were no major errors observed during the check, which revealed the consistency of the data entered. After feeding each data set, a reliability check programme was run to obtain the reliability of the data entered.

The major limitation of this data is that the main aim of this data collection was not to find the determinants of tobacco use in the area. Hence some of the determinants such as parents' tobacco use, tobacco use of the role models etc. were not studied. Another major limitation of the study is the long duration of data collection. A period of over five years was spent in collecting the baseline data.

7. SUMMARY AND CONCLUSIONS

To carry out an effective intervention strategy for any issue, it is essential to know its prevalence and the factors associated with the issue under study. The use of tobacco is associated with many diseases and it is important to prevent the use tobacco in the community. This study was conducted to estimate the prevalence of the different forms of tobacco habit and the association with socio-demographic determinants and with the use of alcohol in rural Kerala, India. In India tobacco is frequently used in smokeless from as chewing tobacco and is also smoked in the form of bidi, a handmade local form.

It was observed that the prevalence of any form of tobacco smoking was 57% in men. Combined smoking (24.6%) was more prevalent compared to bidi smoking alone (10.5%) or cigarette smoking alone (15.5%). The prevalence of smokeless tobacco habit was 26% among men. Among women bidi smoking was rare (1.0%) compared to men and other types of smoking (0.5%) were not common either. The prevalence of smokeless tobacco habit was 15% in women.

The factors studied as determinants of tobacco use included age, gender, religion, marital status, education, occupation, socio-economic status and alcohol use.

Among men, the bidi smoking habit was 16 times more common in those above the age of 50 years than in those of age below 30 years. But cigarette smoking was only 1.3 times, smokeless tobacco 3 times and combined habit 4 times more common among those above the age of 50 years than in those who were younger than 30 years. Among women, the bidi smoking habit was 16 times more common in those with age above 50 years than in those younger than 50 years. The smokeless tobacco habit was four times more common among women above the age of 50 than in those whose age was below 50 years.

Among men, bidi smoking was less frequent among Christians than among the other two religious groups. There was not much difference in the prevalence of cigarette smoking. With regard to smokeless tobacco, however, Hindus consumed more of it than the other two groups. Among women, the smokeless tobacco habit was less common among Christians than among the Hindus and Muslims. A higher proportion of the followers of Islam than Hindus or Christians smoked bidis. Among Muslim men, the tobacco habit was less common than in Hindus, with bidi smoking being 0.9 times, cigarette smoking 0.8 times, smokeless tobacco 0.6 times, and combined habit 0.8 times. Among Muslim women, bidi smoking was 1.8 times more common and smokeless habit 26% less common than among the Hindus.

The prevalence of all types of tobacco use was higher among the married compared to the single in both genders. Bidi smoking habit among males was only 1.4%, cigarette smoking 11.2%, combined habit 4.9% and smokeless tobacco habit 10.1% among the single. The adjusted OR was 4.3 for bidi smoking, 3.3 for cigarette smoking, 6.5 for combined smoking and 4 for smokeless tobacco use for the married compared to the single. Among women, too, the prevalence was higher in the married compared to that in the single. The OR for the married compared to the single was 3.3 and 6 for bidi smoking and smokeless tobacco respectively.

There was an inverse relation between education and prevalence, especially with respect to bidi smoking and smokeless tobacco use. Among men, those who had higher than college level education, the prevalence of bidi smoking was only 0.9% and smokeless tobacco habit 9.6%, and combined habit 4.6%. But the prevalence of cigarette smoking among them was 15.8%. None of the women who had studied beyond middle school level had the habit of bidi smoking, but a small percentage used tobacco for chewing. Compared to the illiterate men, those who studied up to college level had 87% less chance of acquiring the bidi smoking habit, 35% less chance of cigarette smoking, 73% less chance of smokeless tobacco and 82% less chance of combined smoking habit. Women who had studied up to middle school level had 84% less chance of getting the bidi smoking habit when compared to the illiterates.

Assuming that the observed association represents causality, the study reveals that if the use of alcohol is removed from the community, it may be possible to prevent about 78% of bidi smoking, 83% of cigarette smoking, 89% of combined smoking and 87% of smokeless tobacco among men. Among men, 39% of bidi smoking, 19% of combined smoking and 20% of smokeless tobacco habit and among women, 64% of bidi smoking and 44% of smokeless tobacco habit can be eliminated from the population if the education of the population is brought above the primary level. Among men, bidi smoking habit can be reduced by 72%, combined smoking by 57% and smokeless tobacco by 35% and among women about 81% of bidi smoking and 68% of smokeless tobacco can be reduced through income modification.

Other determinants are obviously not modifiable. However, preventive actions may be important to direct especially in populations characterized with these determinants. Educational intervention may have to be considered to bring about behavior changes in the risk groups. Of the risk factors classified as non-modifiable in this study, age and marital status are most associated with the tobacco habit. The PAR for age among men ranges from 29% to 86% with different types of tobacco use. Among women, in the case of bidi smoking PAR was 92% and in the case of smokeless tobacco habit it was 73%.

It is difficult to estimate the overall prevalence of different types of tobacco uses in India from the available literature because of variations in the research designs and reliability of the results. The uses of tobacco and alcohol have some association with the family factors. When young, most individuals depend on their parents for their needs, and hence the chances of initiating tobacco habits will be low. As age increased, the individuals will become independent and the chances increased for acquiring tobacco habits. This is same as in the case of marital status too, as marital status is associated with age. Compared to other determinants there was not much relationship observed between different religions with regard to the tobacco habit. This may be because none of the religions restricts the use of tobacco. However, in this study some new results emerged and some consistent ones were confirmed.

The prevalence of any type of tobacco use in Christians was lower than in Hindus or Muslims. This finding is contrary to some other results obtained in studies carried out in India. However, the variation by religion was smaller than that based on the other determinants studied. The prevalence of tobacco use in married men and women was substantially higher than in the single. This seems to be valid for other regions of India.

Education, occupation and income are determinants of socio-economic status. The results in this study were adjusted for the confounding effect of other determinants. Keeping the limitations in the methods in mind it seems that occupation was a less important determinant than education or income. This result may be applicable more within India than globally. The difference may be accounted for considering the reason for using tobacco. In India tobacco is used for many reasons, from preventing hunger in the poor to being a fashionable habit among the affluent. Therefore, the different reasons compensate each other and lead to no major variation based on occupation. The prevalence of any tobacco use was mainly low in the highly educated and in the high income group. However, the prevalence of cigarette smoking was high in the high income group. This is an indication that cigarettes are regarded as fashionable, and therefore problems are likely to arise when taking steps for prevention.

The use of alcohol and tobacco is globally interrelated. In India, too, alcohol use seems to be one of the most important correlates of tobacco use even if alcohol consumption is modest among the Hindus and rare among the Muslims.

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10. APPENDICES

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REGIONAL CANCER CENTRE, THIRUVANANTHAPURAM

Natural Background Radiation Cancer Registry

Karunagappally

HOUSEHOLD FORM

Village Code	Panchayat	W.No	H.No.	SUB No.

Head of household:

H.Name		Religion of HH	.....
Place			
P.O		Caste of HH	.....
Near to			

Individuals in the Household

No.	Name	Sex	Age	Relation to head of household
01				Head of household
02				
03				
04				
05				
06				
07				
08				
09				
10				

Income: 1. <500 2. 501-1200 3. 1201-2500 4. 2501-3500 5. 3500+

Type of residence:

Floor:	1. Mud	2.Cement		
Walls:	1.Mud	2.Wood	3.Thatched	4.Cement
Roof:	1.Thatched	2.Terrace	3.Tiled	4.Asbestos
Drinking water:	1.Tap	2.Well	3.Pond	4.Handpump
Bathing:	1.Tap	2.Well	3.Handpump	4.other
Bath room:	1.Yes	2.No		
Environmental Hygiene		1.Dry & Clean	2.Dry & Dirty	3.Marshy

Death in the house during the past 3 years:

	Name of deceased	Relation to HH	M/F	Age death	Cause of death	Yr. of death
01						
02						
03						

NBRR INDIVIDUAL FORM

Individual No. | | | | | | |

H.No. | | | | | | | | | |

Name of HH.....

Name | | | | | | | | | | | | | | | | | | | | | |

Age | | | Sex M F

Relation to HH.....

Where your parents related to each other before marriage: 1. Yes 2.No 3.N.K

If yes, Father is ..... of mother

Parental particulars:

Father | | | Mother | | |

Native place			
Stay in Kgply	Place		
	Duration		
Stay outside Kgply	Place		
	Duration		
Occupation	Present		
	Duration		
	Past first job		
	Duration		
	Second job		
	Duration		
	Third job		
	Duration		
If not alive, age at death			

Where were you born .....

Education: 1. Nil 2. Primary 3. Middle 4. High School 6. College 6. N.K

Place	Age (From-To)	Duration
1	.....	.....
2	.....	.....
3	.....	.....

	Occupation & Nature of work	Duration	Area of work
Present			
Past 1st Job			
2nd Job			
3rd Job			

CHEWING, SMOKING AND ALCOHOL HABIT:

Chewing 1. Never 2. Past 3. Present

	Frequency	Age started	Age stopped	Duration
1. Pan only				
2. Pan+Tobacco				
3. Tobacco only				
4. Others				

Do you spit out the quid? 1. Yes 2. No Do you swallow the quid? 1. Yes 2. No Do you keep the quid in the mouth while sleep 1. Yes 2. No

SMOKING 1. Never 2. Past 3. Present

	Frequency	Age started	Age stopped	Duration
1. Beedi				
2. Cigarette				

ALCOHOL 1. Never 2. Past 3. Present (Measure in ml)

	Frequency	Age started	Age stopped	Duration
1. Toddy				
2. Arrack				
3. Country				
4. Foreign				

Do you consume more than one type in any day? Yes / No

Spouse individual No. | | | | | | |

SPOUSE DETAILS

Marital status S / M / W / D

Is your marriage consanguineous? 1. Yes 2. No

If yes, relationship.....

Name of Spouse : .....

Occupation of spouse 1 ..... Duration 1 .....

2 ..... Duration 2 .....

3 ..... Duration 3.....

Living status of spouse 1. AL 2. ANL 3.D 4. NL

HABIT: Chewing Yes/No Smoking: Yes/No Alcohol: Yes/No

CHARACTERISTICS OF DIET

Major Cereals used as staple diet

Breakfast..... Lunch..... Dinner.....

Vegetable use: (Weekly basis):

1. Every Day 2. 4-6 Days 3. 2-3 Days

Type	If Yes, Freq/ Week			
	< 2 times	2-4	5-8	8+
1. Leafy Vegetables				
2. Other vegetables				
3. Roots & Tubers				
4. Tapioca				

Non-Vegetarian use (Weekly basis):

1. Every Day 2. 4-6 Days 3. 2-3 Days 4. <2Days 5. Never

Type	Never	If Yes, Freq/Week			
		<2 times	2-4	6-8	8+
1. Egg					
2. Fish (Dry/Fresh/Both)					
3. Mutton					
4. Beef					
5. Chicken					
6. Other NV					

Do you consume Fruits (Weekly basis): 1. Every Day 2. 4-6 Days 3. 2-3 Days 4. <2 Days

Type					
	<2 times	2-4	6-8	8+	In season
1. Bananas					
2. Oranges					
3. Grapes					
4. Others					

Do you drink milk? 1. Every Day 2. Occasionally 3. Rarely

Do you drink butter milk? 1. Every Day 2. Occasionally 3. Rarely

Do you use refrigerator for food preservation? 1. Yes 2. No If yes Duration:..... years

History of cancer in family

Name and Address of patient	Site, Type, Treatment and year	Relation to HH

Do you suffer from any disease at present? 1.Yes 2.No

If yes, Details and Treatment taken.....

Past Diseases	At age	Treatment
1.		
2.		
3.		

Do you have any of the following health problems? (Tick mark)

1 2 3 4 5 6 7 8

Mouth

1. Burning sensation in the mouth while eating hot and salty foods
2. Difficulty in opening mouth
3. Nasal bleeding
4. Difficulty in breathing
5. Swallowing difficulty
6. Tongue movement
7. Bleeding from mouth and Gum
8. Non healing under in the mouth more than three weeks

Throat discomforts 1 2 3 4

1. Persistent cough 2. Hoarseness of voice 3. Change of voice

Abdominal discomforts 1 2 3 4 5

Abdominal distension 2. Indigestion 3. Severe abdominal pain 4. Loss of appetite 5. Loss of weight

Bowel habits: 1 2 3 4 5 6

1. Rectal bleeding 2. Constipation 3. Diarrhoea 4. Diarrhoea alternating with constipation
5. Black coloured stools 6. Thin stools

Bladder Habit 1 2

1. Frequent Urination 2. Hematuria

Nervous Disturbances: 1 2 3 4 5 6 7

1. Frequent headache 2. Dizziness 3. Convulsion 4. Double vision
5. Paralysis 6. Tremors 7. Numbness

Do you feel 1. Frequent nausea /vomiting sensation 2. Persistent joint pain with trauma

Have you noticed the following:

Symptoms	How long	Where	Are they enlarging
1. Lump			
2. Wart			
3. Mole			
4. Discolouration of skin			

Visual examination: 1 2 3 4 5 6 7 8

1. Mouth ..... 2. Lips .....
3. Buccal mucosa ..... 4. Tongue .....
5. Neck ..... 6. Thyroid .....
7. Skin ..... 8. Other body lumps .....

WOMEN

Age at: Puberty ☐☐ Marriage ☐☐ Menopause ☐☐

If menopause 1. Natural 2. Artificial
If Artificial, why? .....

Pregnancy history

Order	Age	FTND/CS/Abort/P/D (If D, age)	Order	Age	FTND/.../Abort/P/D (If D, age)
1			6		
2			7		
3			8		
4			9		
5			10		

Methods of contraception

1. Male sterilization 2. Female sterilization 3. IUD-Copper T.Loop
4.. Oral pills 5. Safe period Abstinence 7. Condom

Do you have any of the following complaints? 1 2 3 4

1. Irregular bleeding 2. Purulent discharge 3. Post coital bleeding 4. Bleeding after menopause

CHILDREN (0-14 Years)

Name of the interviewer: ..... Mothers Ind. No. ☐☐☐☐☐☐☐
I Tr ..... II Tr ..... III Tr ...../Unknown ☐
Mother's Name ..... Mothers's age when child was born : .....

Have you noted any of the following symptoms: 1 2 3 4

1. Birth defects 2. White mark in the eye 3. Night sweating Fever with anaemia and bleeding tendency

Mother's sickness history

	Type	Age	P/Not P	Treatment
1				
2				
3				

Name of the Enumerator: Signature: Date: