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Gender Differential in Disease Burden: Its Role to Explain Gender Differential in Mortality

Biplab Dhak
Mutharayappa R

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GENDER DIFFERENTIAL IN DISEASE BURDEN: ITS ROLE TO EXPLAIN GENDER DIFFERENTIAL IN MORTALITY

Biplab Dhak[1] and Mutharayappa R[2]

Abstract

The present paper seeks to provide certain explanation in the Indian context, for the recently observed paradox in gender differential in health. There has been mismatch between gender differential in mortality and morbidity in terms of females experiencing a low rate of mortality despite being confronted with a high level of morbidity as compared to males, particularly from the age 30. Using multiple data sets, it has been observed that gender differential in diseases pattern, severity in illness and greater risk behaviour among males play an important role in explaining the paradox.

Introduction

Generally, it is presumed that morbidity or burden of disease would accentuate mortality of individuals and people with higher burden of diseases are likely to experience higher rate of mortality. However, the expected pathway of higher rate of mortality through higher level of morbidity does not always appear to be so. One of the most talked about evidences, mostly observed in the developed world, relates to the greater survival chances of females- though afflicted with a greater burden of diseases- as compared to males. A similar picture also has been observed for India recently in terms of mismatch between the rate of mortality and morbidity while analyzing gender differential in health outcome. Females in India experience mortality advantage with a higher degree of disease burden or morbidity, particularly from the age of 30, as compared to males (NSSO, 2006, Registrar General of India, 2007).

Many researchers have shown lot of interest in exploring the reasons behind this paradox- females with high morbidity disadvantage ending up with mortality advantage. Researchers like Nathanson (1984), Verbrugge (1982) and others[3] have observed after analyzing US data that gender differential in disease patterns play an important role in explaining the paradox. It has been observed that females experience higher level of morbidity with diseases that are not life threatening. On the other hand, males experience higher level of mortality with diseases that are life threatening.

Nevertheless, studies based on developed countries have not spilled over to India since the paradox in India regarding gender differential in health outcome is relatively a recent phenomenon. Therefore, it is important to look into this aspect for finding out some clues behind the paradox on gender differential in health. In this context, the present paper seeks to examine some of the probable causes behind the paradox in India. The objectives are being fulfilled in the line analyzing gender differential in disease pattern, severity in illness and distribution of causes of death, health care utilization, food consumption and risk behaviour in terms of smoking, drinking alcohol and chewing tobacco. Before going to the results we would like to present a brief review of literature relating to the causes of mortality and causes of gender differential in mortality and morbidity.

[1] PhD Scholar, Institute for Social and Economic Change (PRC), Bangalore-560072. Email: biplab@isec.ac.in.

[2] Associate Professor, Institute for Social and Economic Change (PRC), Bangalore-560072. Email: mutharayappa@isec.ac.in

[3] See, Gove and Hughes 1979; Macintyre, Ford and Hunt, 1999.

Review of Literature

The following section points to the existing literature on various causes of death and some explanations on the gender differential in mortality and morbidity.

Causes of death

Preston (1976) showed that as the rate of mortality changes in any country, the causes of death structure also changes. In general, countries with lower rate of mortality face more deaths from non-communicable or chronic diseases, whereas deaths from communicable diseases are more prevalent among high mortality countries. Most of the developed countries experience low rate of mortality and expectedly experience higher proportion of mortality from chronic, degenerative and non-communicable diseases such as heart attack, stroke, cancer, chronic respiratory problems and diabetes. Recently, World Bank (2006) has also reported that chronic and non-communicable diseases are now the leading causes of death across the globe, accounting for about 60 percent of all deaths.

India is going through a rapid epidemiological transition[4]. Until late seventies, India with the higher level of mortality experienced majority of deaths from infectious, parasitic and respiratory diseases (Sen Gupta and Kapoor, 1970). But the recent picture shows that India has undergone changes with respect to causes of deaths and rate of mortality. As the Registrar General of India reported (1998), non-communicable diseases and injuries are now the leading causes of death surpassing a considerable margin of deaths attributable to communicable diseases. Another recent study conducted in Andhra Pradesh by Joshi et.al (2006) points to a similar evidence with regard to majority of deaths occurring due to non-communicable diseases and injuries. Further, a recent study conducted in Tamil Nadu also indicates a greater proportion of rural deaths occurring due to chronic and non-communicable diseases (Gajalakshmi and Peto, 2004). However, it is to be mentioned here that a cause of death structure is subject to age groups. As Gajalakshmi et al. (2002) showed in a study conducted in Chennai that while infectious diseases were the leading causes of death in the earlier phases of life, injuries and non-communicable diseases amounted for the majority of deaths in the older age groups.

Explanations for gender differential in mortality and morbidity

In sum, women experience a higher level of morbidity with acute diseases which are non-fatal non-fatal. On the other hand, men experience higher rate of mortality with diseases that are life threatening and chronic. Observing with this scenario in the last few decades, social scientists have provided many reasons to explain women's experience with acute and non-fatal diseases and men's with chronic and fatal diseases. Nathanson (1984), Waldron (1976, 1983) and Verbrugge (1985) have extensively reviewed several studies carried out by biologists, demographers, epidemiologists and sociologists, for explaining the gender differences in disease patterns and mortality. Those are (1) biological risks: differences are based on genes or hormones. Biological factors underling gender differences in mortality are discussed extensively By Nathanson (1984) and Verbrugge (1985). As noted earlier, females have greater genetic resistance to any disease since female's extra X-chromosome confers some protection against life threatening diseases as observed by Naeye et al (1971). (2) Acquired risk: risks of illness or injury encountered in a person's profession, life style and health related habits. Gender differences in the exposure to acquired risks can arise in several ways: (a) through differential exposure to hazardous activities related to one's job, adventurous activity etc; (b) through differential access to food and

[4] For details on epidemiological transition, see Omran, 1971.

medical care; (c) through risk-prone health habits such as smoking, drinking, using drugs, rough driving and others. (3) Psycho-social symptoms and care: how people perceive symptoms and assess the severity of diseases. It is believed that psycho-social factors encourage greater awareness about physical symptoms among women leading to advanced and persistent health care. However, some studies have failed to provide concrete evidence on these hypotheses (Macintyre 1993; Davis 1981). (4) Health reporting behaviour and health care: how people report their health to others. Hypotheses are considered for gender differences in health reporting as: (a) females are more willing to report their symptoms to others than males; (b) women recall minor health problems better than men do. However, there is lack of evidence to support these hypotheses too (Waldron 1983; Gove 1985; Nathanson 1978). (c) Lastly, it is perceived that health care success of current health care affects the use of future health care. Health related actions are carried on with the intention of influencing the course of current disease. How well people succeed in a particular health care action affects his/her future health care. In other words, experience of present health care can affect future health care and even future illness perceptions and attitudes. It has been hypothesized that due to women's greater participation in health care, they achieve more success in health care that encourage them to take up future health care practices. Women's active participation in health care speeds up their recovery besides slowing down the progress of chronic and life threatening health problems. Nevertheless, empirical evidences are missing to support the hypothesis as prior health care has a potential impact on gender differences in health care as well as life threatening diseases.

Based on the above mentioned studies with regard to the causes of higher female morbidity with lower rate of mortality, and hypotheses through which gender differential in health occurs in developed nations, it seems rational to test these hypotheses in the context of India. However, the paucity of information prevents us from testing all these hypotheses. Considering the availability of data sets, this study tries to examine two hypotheses relating to gender differential in health may occur: acquired risk, by considering risk taking behaviours, food consumption, and health seeking behaviour.

Data and Methodology

Data Sources

Data for this study were drawn from National Sample Survey (NSS), 60th round, National Family and Health Survey 2nd round (NFHS-2) and National Family and Health Survey 3rd round (NFHS-3). NSS data was collected by the National Sample Survey Organization (NSSO) in India. This survey was conducted between January and June 2004 comprising issues on 'morbidity and health care' at the request of the Ministry of Health and Family Welfare of India (NSS report No. 507; NSSO, 2006). The survey covered an all India representative sample of 73,868 households consisting 3,83,338 household members.

NFHS-2 was carried out in India by the International Institute for Population Sciences (IIPS), Mumbai during the year 1998-1999. The survey covered at the national level, a representative sample of 91,196 households consisting of 89,199 eligible women in the age group 15-49, and was the main respondents of this survey for collecting information on reproductive health, child health and health care etc. However, the survey covered information on some other aspects such as education (above age 6), age, sex, risk prone behaviour in terms of smoking, alcoholism, chewing tobacco etc., and about four diseases- Tuberculosis, Malaria, Jaundice and Asthma- of all household members (4,86,011). This study makes use of information of all household members relating to risk behaviour and two diseases- Tuberculosis and Asthma. These two diseases have been considered to test how gender differential in risk behaviour plays role in shaping gender differential in life-threatening diseases.

Similar to NFHS-2, NFHS-3 was also conducted in India by the International Institute for Population Sciences (IIPS), Mumbai, during the year 2005-06. The survey covered at the national level, a representative sample of 109,041 households, consisting of 124,385 women in the age group 15-49, and 74,369 men in the age group of 15-54. NFHS-3 collected all information as had been collected in NFHS-2 along with some additional information on HIV/AIDS aspects of some selected men and women. This study uses NHFS-3 data to understand only the gender differential in nutritional status since this survey provides information on food consumption and height-weight of both the sexes.

Analysis

The analysis of this study comprises two parts: bi-variant analysis and multivariate analysis. Bi-variant analysis has been used to estimate the disease specific prevalence rates, severity in illness, percentage of seeking health care, exposing to risk behaviour etc. Multivariate analyses –logistic regression model- has been carried out to understand the impact of risk behaviour on the gender differential in the prevalence of two life threatening diseases- Tuberculosis and Asthma. For k explanatory variables and n number of individuals, the model expression is

$$\text{Log}\,[P_i/1\text{-}P_i] = \alpha + \beta_1 X_{i1} + \beta_2 X_{i2} + \ldots + \beta_k X_{ik}$$

Where, P_i is the probability of reporting Tuberculosis or reporting Asthma (in another model). In this model, output is coded upon two categories, 1= reporting Tuberculosis or reporting Asthma and 0 = not reporting Tuberculosis or not reporting Asthma. For both the outcome variables, four separate models have been employed. Model 1 has been carried out to understand the impact of each risk behaviour- chewing tobacco, drinking and smoking- on reporting Tuberculosis and similarly on reporting Asthma. Model 2 to Model 4 have tried to understand how gender differentials in risk behaviour influence gender differential in these two diseases. In each model confounding factors like caste, place of residence, marital status, literacy, work status and household condition have been controlled.

Gender Differential across Disease Patterns

NSS collected information on the status of health as well as disease patterns if any, of individuals who were in ill health since the last 15 days prior to the date of survey. There were a total 41 diseases reported in the survey. All diseases reported in NSS are classified into three groups following the international classification of disease pattern given by the World Health Organization (1992) namely communicable diseases, non-communicable diseases and injuries. Table 1 presents prevalence rates for all major diseases (low prevalent diseases have not been shown in the table), and in aggregate for all communicable and non-communicable diseases and injury. The disease specific prevalence rate is defined as the ratio of number of persons afflicted with a specific disease and the population exposed to the risk of a particular disease. The rate has been expressed per 1000 population

As Table 1 shows, the leading communicable diseases were Diarrhea, Fever, Respiratory illness, Eye ailments and Tuberculosis; the leading non-communicable diseases were cardiovascular diseases, Asthma, Gastritis, Diabetes etc. In general, it has been observed that communicable diseases were more prevalent during the childhood period and non-communicable diseases during the old age period. In other words, it can be said that prevalence rate for non-communicable diseases increased with age. However, communicable diseases like diarrhea, fever, respiratory illness, Tuberculosis etc., were also found with higher prevalence rate during the old age period too.

As far as gender differential in the prevalence rate across all communicable diseases is concerned, females experienced higher prevalence rate as compared to males for most of the age groups. The only exception being the childhood period where female children experienced lower prevalence rate as compared to male children; and old age period showed almost equal prevalence rate for both males and females. Diseases showing gender differential in prevalence rate for the childhood period were diarrhea and respiratory illness where male children were found disadvantaged. For the age group 15-29, gender differential against females was found for fever only. Other age groups like 30-44, 45-59 and above, showed gender differential for three diseases: eye ailment, fever and tuberculosis. Of these diseases, prevalence rate of tuberculosis was found to be higher for males as compared to females. On the other hand, prevalence rates for eye ailment and fever were found higher for females as compared to males'.

Similar to communicable diseases, greater prevalence rate for females from non-communicable diseases was found for most of the age groups. Only for the childhood and early adulthood period, males' prevalence rate was found higher compared to females' as far is total non-communicable diseases are concerned. Nevertheless, gender differential in the prevalence rate of any particular non-communicable disease was found from the age 30 only. For all adult and old age groups, females were found with a higher prevalence rate in respect of diseases like gastritis, bone disorder and cancer. On the other hand, males were found with a high prevalence rate in respect of cardiovascular diseases, asthma, disorder of kidney, tuberculosis, and respiratory diseases etc.

Table 1: Prevalence Rates (per 1000) of Some Leading Diseases by Gender and Age Group:

	Name of Diseases	Age groups											
		0-14		15-29		30-44		45-59		60+		Total	
		M	F	M	F	M	F	M	F	M	F	M	F
Communicable diseases	Diarrhoea	10	7*	2	2	2	3	3	4	6	5	4	4
	Malaria	2	2	1	1	1	1	1	2	2	1	1	1
	Jaundice	0.5	1	1	0.5	1	0.5	1	0.5	0.5	0.5	1	0.5
	Whooping cough	3	3	1	1	1	1	2	2	5	4	2	2
	Fever	24	23	8	10**	8	12**	9	15**	13	15**	14	16*
	Respiratory infection	9	7*	4	4	4	5	7	7	12	11	7	6
	Eye ailments	-	-	-	-			2	4*	15	18**	2	2
	Tuberculosis	-	-	1	1	3	1**	5	2**	6	3**	2	1**
	All	46	42**	18	20*	21	25**	30	35**	59	59	30	33*
Non-Communicable diseases	Gastritis	-	-	2	2	3	6**	6	8*	13	11	3	4*
	Cardiovascular diseases			1	1	7	4**	22	20	59	50*	10	8
	Asthma	-	-	-	-	2	2	8	5**	30	18**	4	3*
	Disorders of bones	-	-	1	1	3	5	6	14**	31	47**	5	7*
	Ailments of kidney	-	-	1	1	2	1	3	2*	6	3**	2	1**
	Neurological disorder	1	1	2	1*	2	3*	4	4	9	9	2	3
	Diseases of skin	2	2	1	1	1	2	2	2	5	3**	2	2
	Diabetes	-	-	-	-	2	1	9	10	23	20	3	4
	Blindness	-	-	-	-	-	-	1	1	6	9*	1	1
	Hearing	-	-	-	-	-	-	-	-	5	5	1	1
	Cancer	-	-	-	-	1	2**	2	3*	3	4*	1	1
	All	9	6**	12	10*	26	31**	69	74	191	196	36	38
Injuries		2	1**	3	1**	6	2**	6	3**	7	7	4	2**

Source: NSS 60th round, 2004;

Note: ** denotes p< 0.01, * denotes p<0.05

Significant gender gap in the prevalence rate of injury was found for males for most of the age groups. Only for the old age period gender gap in the prevalence rate of injury was not found. The gender gap in injury for males for most of the age groups could be attributed to greater exposure to health hazards associated with their risk prone jobs, adventurous activities, sports etc.

Gender Differential in Severity of Illness by Age Group

Severity of illness is an important aspect which is required to be a look for searching the underlying paradox in gender differentials in health. It is generally presumed that severity of illness could lead to high mortality. Therefore, severity of illness would be an important factor in explaining gender differentials in mortality. With a view to finding out the reasons behind the paradox in gender differential in health, this section attempts to analyse the gender differential in severity of illness by age groups. To assess severity of illness, three indicators have been considered in this study: duration of illness, duration of restricted activity days and duration of bed ridden days.

Table 2 shows gender differential in severity of illness across almost all age groups. Particularly, gender differential was found in terms of the restricted activity days and duration of bed ridden days. In both the cases, males were found in a disadvantaged position as compared to females. Greater duration of restricted activity for males over females varied from 3 percent for the old age group to 14 percent for the age group 15-29; for bed ridden days the gender differential varied from 5 percent for the childhood group to 22 percent for the age group 30-44. The general observation is that gender differential for restricted activity days and bed ridden days remained minimal for the childhood period, whereas it was found extremely high for the adult age groups, narrowing down at the old age period. In case of illness episode, gender differential was found negligible; gender differential was marginal for age groups 0-14 and 45-59 with greater duration for males.

Table 2: Duration of Illness, Restricted Activity Days and Duration of Bed Ridden Days by Age Groups and Gender

Age Groups	Illness Episode			Restricted Activity Days			Bed Ridden Days		
	M	F	F/M	M	F	F/M	M	F	F/M
0-14	6.78	6.52	0.96*	4.57	4.34	0.95	3.01	2.86	0.95
15-29	9.07	9.02	0.99	6.65	5.72	0.86**	4.03	3.01	0.75a
30-44	10.48	10.50	1.00	7.26	6.32	0.87**	4.11	3.21	0.78a
45-59	12.01	11.71	0.98*	7.76	7.10	0.91**	4.26	3.46	0.81a
60+	13.04	13.07	1.00	8.69	8.46	0.97	4.68	4.29	0.92
Total	**10.46**	**10.58**	**1.01**	**7.12**	**6.70**	**0.94****	**4.02**	**3.49**	**0.87a**

Source: NSS 60th round, 2004;

Note: **< 0.01, b denotes *<0.05

As far as the duration of illness episode, restricted activity days and bed ridden days are concerned, it has been observed that there was a strong relationship found between the age of an individual and duration of illness. Each of the episodes mentioned increased with age for both males and females. The illness episode increased from around 6.5 days for the childhood period to 13 days for the old age period; and the restricted activity days increased from around 4.5 days for the childhood period to 8.5 days for the old age period; and, bed ridden days increased from about 3 days for the childhood period to 4.5 days for the old age period.

Comparing Illness, Severity of Illness with Mortality by Age Group

After analyzing gender differential in disease prevalence rate, severity of illness in terms of restricted activity days and bed disability days, and gender differential in percentage distribution of major causes of death in rural India, this section tries to provide some probable explanations for the newly observed paradox in India in terms of why males die while women become sicker, particularly after the childhood period.

Age group 0-14. This age group was found by excessive male morbidity rate with marginally high female mortality as compared to males. At the same time, males experienced more severe illness in terms of

restricted activity days and bed ridden days than females. Looking at the gender differential in disease pattern and major causes of deaths in rural India, it can also be said that males' morbidity prevalence rate was higher for diseases that caused majority of deaths in the childhood period; and those diseases were found to be respiratory illness and diarrhoea. Therefore, given the biological superiority of females, one can expect that males should have ended with higher level of mortality as compared to females. Nevertheless, the expected picture of higher male mortality during the childhood period was not observed in India. At this point, it can only be assumed that there were some hidden disadvantages for female children causing some deaths despite there lower prevalence rate from life threatening diseases and less severity in illness. These disadvantages probably stemmed from gender discrimination in terms of inadequate nutritious food, quality health care or negligence in taking females to hospitals for some minor ailments. Discrimination against female child in intra-household resource allocation in terms of food, quality health was an inevitable and widely accepted phenomenon resulting in high female mortality in India (Das Gupta 1987; Amin, 1990).

Age group 15-29. In the age group 15-29, females experienced higher level of morbidity with almost equal level of mortality with males. This picture of equal mortality rate for both males and females despite a higher level of morbidity in the case of females can be justified mainly on the basis of gender differential in injuries. Injury was the leading cause of death for both males and females for this age group with males experiencing more injuries than females. Other leading causes of death for this age group were Tuberculosis and cardiovascular diseases but no significant gender differential from these diseases has been observed in our analysis. Therefore, we can conclude that though females experienced higher level of morbidity, both males and females ended up with almost an equal mortality rate mainly because of the exposure of males to more physical injuries and severe illness.

Age Group 30 and above. From the age 30, one can observe the paradox (like in the developed nations) - females ending up with a lower rate of mortality despite their high morbidity level- in India. Like in the developed nations, the reasons for the paradox in India can be attributed greater prevalence rate of life threatening diseases. In general, it has been observed that females' prevalence rate was higher than males for both communicable as well as non-communicable diseases. The only exception is being Injury where males' prevalence rate was found to be higher than that of females. However, with regard to major diseases in terms of causing high mortality rate, it has been found that males are more exposed than females. For the age group 30-44, the top four leading causes of deaths (covering around 40 percent of all deaths) were injury, tuberculosis, cardiovascular diseases and cancer, and of these diseases, males experienced greater prevalence rate than females; the only exception being cancer where females' prevalence rate as well as percentage share of mortality was found higher for females than males. However, the percentage share of cancer to the total deaths was much lower than the percentage share of cardiovascular diseases, tuberculosis and injury. Therefore, it can be said that higher prevalence rate of cancer among females was not enough to balance the mortality rate between males and females as against the other life threatening diseases where males were found in a disadvantaged position.

For the age group 45-59, the leading causes of deaths were cardiovascular diseases, respiratory infection, Tuberculosis, Diabetes, cancer and injury covering around 80 percent of all deaths. These killer diseases were found to be more prevalent among males than females. On the other hand, diseases from which females experienced higher prevalence rate as compared to males were fever, eye ailments, disorder of bones and cancer; and except cancer, other diseases were less life threatening. Therefore, similar to the earlier age group, it can be concluded that in this age group males suffered from diseases which were more life threatening

and that in combination with males' higher severity of illness in general, ended up with greater mortality rate than females.

Similarly, it can be seen that old aged males experienced higher mortality rate than females due to the higher prevalence rate of life threatening diseases and greater severity of illness than females. The life threatening diseases from which older men reported higher prevalence rate than older women were cardiovascular diseases, tuberculosis, diabetes, asthma (respiratory diseases), and kidney related disorders. On the other hand, diseases like fever, eye ailments and disorders of bones were less life threatening; and females suffered more from these diseases as compared to males. The only life threatening disease was cancer from which old aged females suffered more than males.

Factors Influencing Gender Differential of Life Threatening Diseases

As has been noted earlier, apart from biological differences between males and females, there are some other underlying factors influencing gender differential in mortality. Acquired risk- through different life styles, perceptions about sickness and health seeking attitude which can expose males to life threatening diseases and even death- can be considered as on the factors contributing to gender differential in mortality. This section deals with two aspects; gender differential in health seeking behaviour and gender differential in life styles through risk behaviour. Other factors relating to the psychological aspects have not been taken into account in this study due to the non-availability of data.

First, Gender differential in health care utilization has been observed for both in-patients and outpatients care. Then, gender differential in risk behaviour has been examined in terms of alcoholism, smoking and chewing tobacco. After examining gender differential in risk behaviour, an attempt also has been made to understand as to how impacts health in terms of Asthma and Tuberculosis. These two diseases have been considered for analysis mainly for availability of data and also because these two diseases account for a significant proportion of total deaths in India.

Gender Differential in Health Care Utilization

Gender differential in health care utilization has been examined using national sample survey (NSS) data 60th round. NSS gives information on both in-patients and outpatients regarding health care utilization. In the survey, respondents were asked about their sickness followed by health care utilization in the last 15 days prior to the date of survey. Further, all respondents were asked on whether they were admitted to any hospital in the last one year prior to the date of survey or not.

Table-3 presents the percentage of people reported for seeking health care when they fell sick. It can be seen that around 85 percent of people sought health care when they fell sick and there were no noticeable gender gaps across different age groups.

Table 3: Percentage of Seeking Outpatient Care by Age Groups and Gender.

Age group	Male	Female	Female/male
0-14	85.6	85.1	0.99
15-29	83.3	84.5	1.01
30-44	86.9	87.9	1.01
45-59	87.6	88.7	1.01
60+	83.7	82.2	0.98
Total	**85.2**	**85.2**	**1.00**
N	**18790**	**19963**	

Source: NSS 60th round data, 2004;

This picture of gender neutrality in terms of health care utilization appears contrary to the existing literature. India was known for striking gender discrimination against females in terms of food intake, health care etc. and further it resulted in excess female mortality particularly for the childhood and early adulthood period. With this recent observance of gender equality in outpatient health care, it can be said that females are no longer prevented from seeking at least outpatient care and the easing of gender discrimination might have helped females avoid excess mortality they used to experience until recently.

Table 4: Percentage of People Seeking In-patient Care by Age Groups and Gender

Age group	Male	Female	Female/male
0-14	5.3	3.4	0.64**
15-29	5.3	6.6	1.25**
30-44	7.9	9.7	1.23**
45-59	14.2	11.5	0.81**
60+	16.2	12.3	0.76**
Total	**7.8**	**7.3**	**0.94***
N	**18790**	**19963**	

Source: NSS 60th round, 2004;

Note: ** denotes p< 0.01, * denotes p<0.05

Another measure of health care i.e. hospitalization rate for the last one year prior to the survey date has been presented in Table-4 by age group and sex. It is observed that except for the age group 15-29, males were admitted to hospital in a greater extent than females. The age group 15-29 is the prime reproductive age group and it can be assumed that reproductive health problems may cause some extra burden for females resulting in their hospitalization. Therefore, in general, females used less health care in terms of hospitalization as has been observed from the NSS survey. Nevertheless, greater hospitalization rate can be thought of in different ways; it may be one indicator of severity of a particular disease since hospitalization takes place in the event of serious illness only. Therefore, greater hospitalization rate of males for most of the age groups may indicate that males suffered from more severe illness as compared to females and thus ending up with greater mortality.

Gender Differential in Food Consumption and Nutritional Status

Adequate amounts of protein, fat, carbohydrates, vitamins and minerals are required for balanced diets and for better health of both males and females. Balanced diet can also help people avoid life-threatening diseases. Given the gender differential in life-threatening diseases across different stages of life course, it is worthwhile to examine food habits as well as nutritional status.

In NFHS-3, a question had been put to both women and men about how often they consumed various types of food (daily, weekly, occasionally or never). It was found that the pattern of food consumption was more or less similar for males and females for pulses, vegetables and fruits. The variations were observed only in terms consumption of milk or curd on a regular basis and Egg, Fish and Chicken; and further men were found consuming more of these items than women. Nevertheless, it is required to mention that NFHS-3 gives information on food consumption for various types of foods by different time intervals making it difficult to draw any definitive observations about the gender differential in food consumption pattern. To get a single indicator of food consumption, an index has been constructed taking into account eight food items and frequency of consumption. Information on eight food items has been collected for four categories. For example, for the consumption of milk, four categories have been given as daily, weekly, occasionally and never. The scores given

are 3, 2, 1 and 0 for daily, weekly, occasionally and for never respectively. Total score of all food items has been taken into account to represent the quantity of food consumed.

Table-5 presents the average-food consumption index for both males and females by some age groups[5]. It can be seen that females were likely to consume less food as compared to males: the constructed index based on frequency of eight food items consumed 6-7 percent lower for females than males. Therefore, it can be simply interpreted that females were discriminated against as far as intra-household food allocation was concerned. However, this differential could be due to mere differentials in food habits between males and females. The perception that there was no gender discrimination as such in terms of food allocation gets stronger when we look at gender differential in nutritional status. NFHS-3 has shown that except for the age group 20-39, there was no gender differential in the percentage of thin population (BMI < 18.5): for the age group 15-19, males were thinner than females, and for the age group 40-49, no differential has been found. Therefore, better nutritional status of females for the age group 15-19 indicates that gender discrimination against females in food consumption did not exist actually and poorer nutritional status of females for the age group 20-39, might have arisen due to the burden relating to child bearing activity.

Similar to the age group 15-49, childhood period also experienced no remarkable gender discrimination, as far as food allocation was concerned. NFHS-3 gives information about vitamin-A and Iron supplements to the children aged 6-59 months. The reports show that gender differential in Vitamin-A and Iron supplements were very marginal. While 18.4 percent male children received Vitamin-A supplements, 17.4 percent female children received the same. On the other hand, the percentage of males and females who received Iron supplements were 4.9 percent and 4.4 percent respectively.

Table 5: Average Score in Terms of Food Consumption by Gender and Age Group

Age Groups	Male	Females	Males/Females
15-19	12.13	11.28	0.93**
20-29	12.50	11.59	0.93**
30-39	12.34	11.44	0.93**
40-49	12.07	11.31	0.94**
Total	**12.28**	**11.44**	**0.93****

Source: NFHS-2, 2005-06

Note: **denotes p< 0.01

Looking at the nutritional status through anthropometric measures of health (NFHS-3 report, 2005-06) it was found that females did not differ from males in terms of all three measures: height-for-age; weight-for-height; weight-for-age. Therefore, it can be said that gender discrimination in food allocation or nutritional status has undergone a tangible change unlike earlier females were found discriminated in intra-household resource allocation; and it might have been one of the factors in terms of females avoiding excess mortality as compared to males during the childhood period.

Gender Differential in Risk Behaviour and its Association with the Prevalence of TB and Asthma

Tobacco use and drinking alcohol are the most important avoidable causes of poor health worldwide. The World Health Organization (WHO, 1997) attributes 4.9 million deaths a year to tobacco abuse and the figure is

[5] NFHS-3 does provide information about food consumption for the age group 15-49 and 15-54 of females and males respectively.

expected to rise to more than 10 million deaths by 2030. Similarly, approximately 2 billion people worldwide consume alcohol, and around 76 million or more than 1% of them have been estimated to be suffering from alcohol consumption disorders. The Global Burden of Disease study estimated in 2000 that alcohol was responsible for 3.2% of global deaths and 4% of global disability-adjusted life years.

Gender differential in risk behaviour

There is a pronounced gender differential in risk-taking behaviour throughout the world. WHO (1997) estimated that 47% of men and 12% of women smoke, including 42% of men and 24% of women in developed countries, and 48% of men and 7% of women in developing countries. In India, the picture of gender differential in risk taking behaviour is found to be almost similar to the developed countries. According to NSS 50th round survey, around 52 percent males and 13 percent of females were tobacco users. NFHS-2 also provides the same pattern regarding gender differential in using tobacco and alcohol. Nevertheless, this section presents gender differential in smoking, drinking alcohol and chewing tobacco by age group from NFHS-2 since this survey only gives information on risk behaviour of people of all age groups.

As can be seen from Table 6, there was a significant gender differential in all types of risk behaviour. In total 28 percent of people were reported to *chewing tobacco* or *pan masala* as against 12 percent of females. This proportion varies from 18 percent for men and 2 percent for women in the age group 15-29 to 33 and 22 percent respectively in the age group 60 and above.

In terms of the consumption of alcohol, wide differences have been observed between males and females. 17 percent of men, but only 2 percent of women reported for drinking alcohol. In the latter age groups, the proportion is found higher for both the sexes with 27 percent of men and 4 percent of females at the age group 45-59 reporting for drinking alcohol; for the old age group, it amounts to 19 percent and 3 percent for males and females respectively.

Table 6: Percentage of People Chewing Tobacco, Drinking and Smoking by Age Group and Gender.

Age Group	Chewing Tobacco		Drinking		Smoking	
	M	F	M	F	M	F
0-14	0.6	0.4	0.4	0.3	0.2	0
15-29	18.1	5.8	9.1	1.7	14.7	0.9
30-44	33.4	13.8	26.5	3.2	40.9	3.5
45-59	33	19.6	25.6	4	45.6	6.3
60+	33	21.6	19.2	3.3	39.2	6.0
Total	**28.3**	**12.4**	**16.7**	**2.2**	**29.4**	**2.5**

Source: NFHS-2, 1998-99

At the aggregate level, smoking rate was substantially higher for males; with men accounting for 29.4 percent, while females accounting for about only 2.5 percent. The proportion of smoking was also high for the middle age group; it varied from 15 percent for males and 1 percent for females in the age group15-29 to 46 percent and 6 percent respectively in the age group 45-59. In the old age group, the percentage remained at 39 and 6 respectively.

Gender differential in the prevalence of TB and Asthma by age groups and risk behaviour

Table 7 presents the prevalence rate of TB and Asthma for the population those who indulged in risk behaviour and those who did not. Age group wise analysis has not been done for a very small number of cases of risk taking females. Nevertheless, this table clearly demonstrates that chewing tobacco, smoking and drinking alcohol

were strongly associated with the higher level of prevalence rate of Asthma or TB. The higher prevalence rates among people who had indulged in risk behaviour were common for both the sexes. As far as gender differential in the prevalence rate is concerned, variations have been found for risk prone group population. Females experienced higher Asthma prevalence rate than males while both males and females were in thw risk-prone group. On the other hand, among the non-risk prone group population, prevalence rate of Asthma was almost the same for both males and females. Therefore, it is clear that if females had indulged in risk behaviour in the same way as males did, females would have experienced higher prevalence rate from Asthma than males. Nevertheless, we have observed lower prevalence rate among females than males from NSS 60th round as well as NFHS-2[6] and this result can be attributed to males' greater risky behaviour.

Table 7: Prevalence Rates (per 1000) of Asthma and TB for Males and Females by Risk Behaviour.

			Male	Female	Female/Male
ASTHMA	Chewing Tobacco	NO	21	21	1.00
		YES	45	53	1.18*
	Alcohol	NO	23	23	1.00
		YES	42	54	1.29**
	Smoking	NO	21	22	1.05
		YES	44	81	1.84**
TB	Chewing Tobacco	NO	5	4	0.80
		YES	14	13	0.93
	Alcohol	NO	6	5	0.83**
		YES	13	17	1.31**
	Smoking	NO	5	5	1.00
		YES	11	19	1.73**

Source: NFHS-2, 1998-99

Note: ** denotes p< 0.01, * denotes p<0.05

In the case of prevalence of TB, males were found with higher rate than females among the non-risk group people. However, when it comes to risk group population, females' prevalence rate exceeded the prevalence rate of males. The only the exception being the case tobacco chewing; for both risk and non-risk group population, males' prevalence rate from TB was higher than that of females. Therefore, once again it can be concluded that risk behaviour plays an important role in exposing males to life threatening diseases as has been observed from the two life threatening diseases- Asthma and Tuberculosis.

Multivariate analysis

It is no longer require to mention that risk-taking behaviour in terms of chewing *pan-masala*, smoking or alcoholism is harmful to health. The bi-variant analysis has shown similar picture for the prevalence of Asthma and Tuberculosis in the earlier section. Nevertheless, a substantial and growing body of research demonstrates an inverse relationship between socio-economic condition and health (Williams and Collins 1995; McDnough et al, 1997). Along with socio-economic factors, some demographic variables such as age and marital status were found to be most important in influencing health (Goldman et al. 1995). Given these various demographic and socio-economic factors multivariate analysis is required to understand the exact relationship between risk behaviour and health. The multivariate analysis shows the prevalence rate of TB or Asthma in relation to risk behaviour, besides taking into account other factors.

For this analysis, logistic regression has been adopted considering dichotomous nature of the dependent variables: TB and Asthma. The independent variables- caste, place of residence, occupation, standard of living,

[6] Prevalence of Asthma and Tuberculosis by age group and sex using NFHS-2 data is given in table-10 in the appendix.

sex, risk behaviour, age and marital status- have been factored into with a view to explaining socio-economic, demographic and household conditions.

Table 8 presents the odds of reporting Asthma and Tuberculosis, taking other socio-economic and demographic factors into account. It can be seen that the odds of reporting asthma and Tuberculosis were higher for the risk taking behaviour. All types of habits like chewing tobacco, drinking alcohol and smoking are found to be important in enhancing the chances of suffering from Asthma as well as Tuberculosis.

Table 8: Odds ratios of Experiencing Asthma and Tuberculosis by Respondents' Risk Behaviour and Gender

		Asthma	Tuberculosis
Model 1	**Risk Behaviour[a]**		
	Chewing Tobacco (Ref. not chewing)	1.62**	1.79**
	Drinking Alcohol (Ref. not drinking)	1.02	1.22**
	Smoking(Ref. not smoking)	1.52**	1.19**
	Sex(Ref. male)	0.87**	0.72**
Model 2	**Chewing Tobacco*Sex[b]**		
	Not chewing tobacco-Male	1	1
	Chewing tobacco-Male	1.47**	1.63**
	Not chewing tobacco-Female	0.83**	0.67**
	Chewing tobacco-Female	1.58**	1.45**
Model 3	**Drinking Alcohol*Sex[c]**		
	No drinking Alcohol-Male	1	1
	Drinking Alcohol-Male	0.94*	1.12*
	No drinking Alcohol-Female	0.85**	0.69**
	Drinking Alcohol-Female	1.05	1.36**
Model 4	**Smoking*Sex[d]**		
	No Smoking-Male	1	1
	Smoking-Male	1.35**	1.04*
	No Smoking-Female	0.82**	0.66**
	Smoking-Female	2.00**	1.65*

Note: (1) a = caste, place of residence, marital status, literacy, work status and household condition are controlled
b = caste, place of residence, marital status, literacy, work status and household condition, smoking and drinking behaviour are controlled.
c = caste, place of residence, marital status, literacy, work status and household condition, smoking and Chewing tobacco are controlled.
d = caste, place of residence, marital status, literacy, work status and household condition, chewing tobacco and drinking behaviour are controlled.
(2) ** denotes $p<0.01$; * denotes $p< 0.05$.

As far as gender differential is concerned, males were found to be experiencing from both Asthma and Tuberculosis as found in the bi-variant analysis. This analysis also tried to examine whether there was any sex difference in the impact of risk behaviour on Asthma and Tuberculosis. Model 2 to model 4 have been carried out to assess sex differences in terms of the impact of chewing tobacco, drinking alcohol and smoking on the incidence of Asthma and TB respectively. It can be observed that there was some gender differential in the impact of risk behaviour on the disease prevalence rate. Controlling other confounding factors, the analysis shows that females were more likely to be exposed to the risk of Asthma and TB as compared to males, if found in the risk prone behaviour group and if found in the non-risk prone group, they were likely to report for lower prevalence of Asthma and TV.

Summary and Conclusion

This paper tries to explain the recently observed paradox in India relating to gender differential health in terms of morbidity and mortality. Why females experience lower level of mortality despite their higher level of morbidity

particularly from the age 30 as compared to males. First it has been observed that gender differential in disease pattern plays an important role in explaining the paradox. Except for the childhood period, females experience greater morbidity than males in general. Except injury, females also suffer more from both communicable as well as non-communicable diseases. However, when it comes to diseases that cause more deaths, males are found up front. From childhood to old age period, diseases causing majority of deaths in any particular age group are found to be more prevalent among males than among females. For example, prevalence rates of diarrhoea, respiratory illness for childhood period, cardiovascular diseases, Tuberculosis, respiratory diseases (Asthma), diabetes for the adult and old age groups, are found to be higher among males; and these diseases are also found to be the leading cause of deaths in the respective age groups. Another important factor that helps explaining high mortality rate of males relates to injuries or accident. It is found that across all the age groups males are more prone to injuries than females.

However, it has been observed that, unlike in the developed nations, biological advantages in mortality of females are not to be found in the Indian context for the childhood and early adulthood period despite males' greater prevalence rate across life threatening diseases and injuries. In this context, it can be assumed that discrimination against females at the early stages of life still persists in India and that discrimination prevents females from enjoying biological advantage of low mortality. However, in terms of food and health care (outpatient care) significant discrimination has not been observed.

Further, severity of illness measured in terms of duration of illness episode, restricted days and bed ridden days seems to be an important factor in causing high male mortality rate. Through all stages of life-course, males are reported for more restricted days as well as bed ridden days that, in turn, seem to result in excess male mortality besides their life-threatening diseases.

This study also has tried to find out pathways through which excess prevalence rate of life threatening diseases in respect of males emerged by analyzing gender differential in health care utilization and risk behaviour. Studies based on developed nations have shown that females avail themselves of more health care or visit doctors more frequently than males do and that behaviour help females to aware more about illness and that result more reporting of sickness. Again, substantial health care utilization is expected to help females avoid life-threatening diseases. Nevertheless, India is known for gender discrimination in terms of health care utilization, food allocation etc. Studies conducted during the nineteenth century point out females being restricted from seeking health care leads to poorer health status (Dasgupta, 1995; Basu 1989; Sen 1988; Miller1981). Therefore, it was expected that Indian females would not seek health care in a way similar to their counterparts in the developed nations. Rather, it was expected that females' health seeking behaviour would be less as compared to males. However, recent data provides a different picture. It has been found that females are no longer discriminated against in terms of seeking at least out patient health care. Across all stages of life course, percentage of females seeking outpatient health care has been found on par with males. With this picture of gender equality in outpatient care, it can be said that presently easing of gender discrimination in terms of health care might be helpful in experiencing biological advantage of low mortality by females from the adult age group. Another measure of health care utilization i.e. hospitalization rate to the last one year has also been considered. In terms of hospitalization, we have found males' rate of hospitalization higher than females' for all the age groups. This high hospitalization rate among males can be explained in terms of severity of diseases since hospitalization takes place mostly in the event of serious illness.

Along with health care utilization, relaxation of gender discrimination has also been observed for food consumption or food allocation. For the childhood period and age group 15-49, it is observed that females are no longer discriminated against with respect to their counterparts in food consumption. The similar picture also has

been noticed through some nutritional measures: such as percentage of thin population; anthropometric measures. With this picture, it can be said that relaxation of gender discrimination in food consumption as well as health care utilization might result in low female mortality.

The most convincing pathway for males experiencing life-threatening diseases across different stages of life lies in the gender differential arising out of in risk behaviour. Pronounced gender differential in risk behaviour in terms of smoking, alcoholism and chewing tobacco is well known across the globe. Percentage of females indulging in risk behaviour is found to be much lower than that of males'. This study also once again supports the existing fact that males use more substance items, alcohol and tobacco as compared to females. For the two chronic and life threatening diseases -Asthma and Tuberculosis, prevalence rates are significantly higher among risk takers than their counterparts. Chewing *pan-masala* and smoking have shown strong association with the prevalence of Tuberculosis and Asthma respectively. Given the lower risk taking behaviour of females, prevalence rate of Asthma and Tuberculosis has been expectedly found lower among females than males.

Nevertheless, this study could not take into account all types of life threatening diseases in relating to risk-taking behaviour because of non-availability of data; but association with the Asthma and Tuberculosis provide some indication regarding the pathways of males' life threatening diseases.

In conclusion, Indian females experience higher level of morbidity with regard to more acute or less life threatening diseases. On the other hand, males experience lower disease burden with regard to more life threatening diseases. The experiencing of more life threatening diseases or higher mortality rate among males across adult age groups is probably the result of males' greater risk behaviour in terms of smoking, chewing pan masala and drinking alcohol. Therefore, this study expects that policy makers pay serious attention towards males' health, particularly for the latter age groups. Although, females continue to be are still discriminated against, particularly in the early age groups, males deserve some attention because of their greater risk behaviour besides their facing life threatening diseases.

Appendix

Table 9: Percentage Distribution of Deaths by Major Causes, Sex and Age Group in Rural India, 1998

	Age Groups											
	0-14		15-29		30-44		45-59		60+		Total	
	M	F	M	F	M	F	M	F	M	F	M	F
Diarrhea	16.3	14.3	0.4	0.2	0.6	0.4	0.4	0.5	0.8	0.9	5.1	5.1
Malaria	1.3	1.4	0.2	0.2	0.1	0.2	0.0	0.1	0.0	0.0	0.3	0.5
Jaundice	0.0	0.0	0.8	0.6	0.9	0.4	0.9	0.4	0.3	0.1	0.5	0.2
Respiratory infection	21.3	21.0	1.9	1.6	1.6	1.0	1.4	1.4	9.0	5.7	10.1	11.1
Tuberculosis	0.5	0.5	10.1	9.6	14.1	12.7	10.6	7.1	3.8	2.0	5.4	3.5
Nutritional deficiency	1.6	2.4	1.0	0.6	0.7	1.7	1.3	3.3	0.4	0.8	0.9	1.7
Cardiovascular	1.4	1.6	7.4	8.4	12.2	12.1	33.5	30.0	45.7	48.6	25.3	25.2
Respiratory diseases	0.6	0.6	1.6	1.8	2.8	3.8	9.9	11.9	9.1	8.1	5.7	5.3
Neurological	0.6	0.6	2.1	1.2	3.1	1.3	1.5	1.3	2.6	2.6	1.9	1.6
Diabetes	0.1	0.1	0.6	0.4	0.7	0.6	2.2	2.5	2.5	2.5	1.5	1.4
Injuries	4.1	2.3	27.0	21.7	18.3	14.2	9.0	8.4	3.9	4.0	7.7	6.9
Cancer	0.6	0.6	3.7	3.6	4.9	7.7	8.4	14.2	11.4	10.6	6.7	7.0
Digestive diseases	1.0	2.4	3.7	5.8	3.9	4.8	5.8	5.9	3.3	2.9	3.1	3.4
Others	50.5	52.2	39.4	44.4	36.0	39.2	15.0	13.0	7.2	11.2	25.8	27.2

Source: Annual report of survey of causes of death (rural India), 1998

Table 10: Prevalence rate (per 1000) of Asthma and Tuberculosis by sex and age group

Age Groups	Asthma			Tuberculosis		
	Male	Female	F/M	Male	Female	F/M
0-14	12	10	0.83	2	2	1.00
15-29	10	11	1.10	4	4	1.00
30-44	21	22	1.05	10	8	0.80
45-59	51	51	1.00	13	9	0.69
60+	114	87	0.76	18	10	0.56
Total	**25**	**23**	**0.92**	**7**	**5**	**0.71**

Source: NFHS-2 data, 1998-99

Table 11: Disease Specific Death Rates by Age Group and Sex

	Age Groups											
	0-14		15-29		30-44		45-59		60+		Total	
	M	F	M	F	M	F	M	F	M	F	M	F
Diarrhea	1.01	0.96	0.01	0.00	0.03	0.01	0.04	0.03	0.68	0.67	0.41	0.36
Malaria	0.08	0.09	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.02	0.04
Jaundice	0.00	0.00	0.02	0.01	0.04	0.01	0.10	0.03	0.26	0.07	0.04	0.01
Respiratory infection	1.31	1.41	0.04	0.03	0.07	0.03	0.15	0.09	7.70	4.26	0.81	0.78
Tuberculosis	0.03	0.03	0.21	0.18	0.59	0.33	1.16	0.48	3.25	1.49	0.43	0.25
Nutritional deficiency	0.10	0.16	0.02	0.01	0.03	0.04	0.14	0.22	0.34	0.60	0.07	0.12
Cardiovascular	0.09	0.11	0.15	0.16	0.51	0.31	3.65	2.03	39.10	36.32	2.02	1.76
Respiratory diseases	0.04	0.04	0.03	0.03	0.12	0.10	1.08	0.81	7.79	6.05	0.46	0.37
Neurological	0.04	0.04	0.04	0.02	0.13	0.03	0.16	0.09	2.22	1.94	0.15	0.11
Diabetes	0.01	0.01	0.01	0.01	0.03	0.02	0.24	0.17	2.14	1.87	0.12	0.10
Injuries	0.25	0.15	0.55	0.41	0.77	0.36	0.98	0.57	3.34	2.99	0.62	0.48
Cancer	0.04	0.04	0.08	0.07	0.21	0.20	0.92	0.96	9.75	7.92	0.54	0.49
Digestive diseases	0.06	0.16	0.08	0.11	0.16	0.12	0.63	0.40	2.82	2.17	0.25	0.24
Others	3.11	3.51	0.80	0.84	1.51	1.01	1.64	0.88	6.16	8.37	2.06	1.90

Note: Disease specific deaths rates are calculated using SRS age specific death rates and proportion of diseases specific deaths from table 10.

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INSTITUTE FOR SOCIAL AND ECONOMIC CHANGE
Dr V K R V Rao Road, Nagarabhavi P.O., Bangalore - 560 072, India
Phone: 0091-80-23215468, 23215519, 23215592; Fax: 0091-80-23217008
E-mail: lekha@isec.ac.in; Web: www.isec.ac.in