

## A comparative study on adult mortality of Nepal

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### Abstract

**Background:** Adult mortality (15-49 years) is one of the major public health issues which remains neglected in many developing countries like Nepal. Only limited data are available which is insufficient to identify the cause and level of mortality among adults.

**Objectives:** The aim of the study is to explore and compare the adult mortality rate of Nepal between 1996, 2001 and 2006 surveys.

**Materials and methods:** This is comparative study conducted by using secondary data extracted from Nepal Family Health Survey (NFHS, 1996), National Census Report 2001 and Nepal Demographic and Health Survey (NDHS, 2006). Statistical analysis was done using Microsoft excel soft ware. The adjusted mortality rates were computed using 2001 census population as standard population.

**Result:** This studied showed there was statistical evidence of declining age specific mortality rate between 1996 and 2006 survey for both men and women respectively ( $p < 0.05$ ). Annually adult men mortality rate and adult women mortality rate was found to be declining by 1% and 3.2% respectively. Women mortality rate declined by 2.26 times as compared to men mortality rate over ten year's period.

**Conclusion:** There is a need of in-depth analysis of adult mortality in the developing countries like Nepal.

**Keyword:** Adult mortality, Nepal

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In most of the developing countries, public health programs have been directed towards reducing maternal, infant and childhood mortality. Adult mortality i.e. deaths at 15 – 49 years, has received much less attention due to widespread impression that adult mortality is low. Adult mortality in the developing countries has ranked low on the international and national agenda<sup>1,2</sup>.

Demographic changes such as declining level of child mortality and fertility have led to increasing importance of adult health. Many communicable diseases like HIV/AIDS and non communicable diseases are becoming more important as a cause of adult morbidity and mortality which needs reorientation of health policy<sup>1</sup>.

In most of the countries, little is known about adult mortality rate. In the context of developing countries like Nepal, It is difficult to find information about adult mortality. Available information on adult mortality is limited and incomplete. The major cause behind the incomplete reporting is poor vital registration system. Despite the continuous effort of government for exhaustive coverage of deaths statistics, it has remained highly under reported. Therefore both direct

and indirect measures of estimation are employed to compute mortality rate of the country<sup>3,4,5,6,7</sup>.

One of readily available household survey data is from demographic and health survey (DHS). Sibling history data collected in these household surveys seems to contain adequate information to estimate adult mortality rate though there are problems of underreporting<sup>4,5,6,7</sup>.

This paper tries to explore and compare adult mortality rate of Nepal using secondary data extracted from Nepal Family Health Survey(NFHS,1996), National Census Report 2001 and Nepal Demographic and Health Survey (NDHS,2006).

### Objectives

1. To know the age-sex specific mortality rate of Nepal at three different time periods (NFHS 1996, Census 2001 & NDHS 2006)

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- To compute age adjusted mortality rate of Nepal for adult men and adult women (using 2001 census as a standard population)
- To compare adult mortality rate (15-49 yrs) of Nepal between three different time periods (NFHS 1996, Census 2001 & NDHS 2006)

### Materials and methods

All secondary data were collected from NFHS 1996, Census 2001 & NDHS 2006 Report. These data were processed in Microsoft Excel Software. Then these data were analysed by using the following statistical formula to compute age specific mortality rate (ASMR), age adjusted mortality rate, confidence interval, comparative mortality index and the significance test<sup>8-10</sup>.

- Age- Specific Mortality Rate = eaths in each age group\*1000/ Total number of person months of exposure in that age group
- Age adjusted mortality rate ( $R_i$ ) = Total number of expected deaths \*1000/Total standard population (Using direct standardization method )  
Where Total number of expected deaths = ASMR of a particular time period \* Standard population of each age group  
Standard Population = Cenus 2001 population (15-49 yrs)
- Comparative Mortality Index = Age Adjusted mortality rate of current period / Age Adjusted mortality rate of previous period
- Confidence Interval (CI) for Age Adjusted Mortality Rate =  $R_i \pm Z * SE (R)$   
Where  $R_i$  = Age adjusted mortality rate for particular time period,  $i$  = year  
 $Z = 1.96$  for 95 % CI,  $SE = \text{standard error} = R_i / \sqrt{N}$   
 $N = \text{Number of deaths}$
- Significance Test ( $T_{cal}$ ) =  $1.96 * \sqrt{(R_1)^2/N_1 + (R_2)^2/N_2}$   
Where  $R_i$  = Age adjusted mortality Rate for the different years  
 $N_i$  = Number of Deaths for different time periods,  $i$  = year  
Difference  $R_1 - R_2 > T_{cal}$ , the difference is statistically significance, Otherwise not.
- Sign test ( $X_0$ ) = Minimum of [# (+) or # (-)] # = Difference of ASDR  
 $p_0 < \alpha = 0.05$ , Significant, Otherwise not.  
( $p_0$  can be obtained from Sign test table)

### Results

Table 1 presents mortality rates for Men and Women of 15-49 years. Overall men mortality rate was 2.65, 2.05 & 2.15 in the year 1996, 2001, and 2006 respectively. Similarly overall women mortality rate was 3.40, 1.58 and 1.95 respectively. It was known that overall crude mortality rate has declined by 18.79% and 42.67% for men and women respectively in ten years period. Age specific mortality rates were also declining in the most of the age group. It was also known that the adult mortality rate for men and women is also declining by 1% and 3.2 % per year.

The fig 1 illustrates that age specific mortality rate changed in all age groups. The age specific mortality rates were not much different before the 35 years of age. The higher proportion of adult mortality rate was found after 35 years of age in all three surveys. The age specific mortality rate was found to be higher in 2006 survey in comparison to 2001 census survey.

The fig 2 reveals age specific mortality rates of women were declined in the 2001 and 2006 as compared to 1996 survey. After 25 years of age, age specific mortality rates were higher in 2006 survey than compared to 2001 survey.

There is statistical evidence of declining age specific mortality rate between 1996 and 2001 survey for men and women respectively (the sign test,  $p = 0.008$  for men,  $p = 0.008$  for women,  $\alpha = 5\%$ ). Similarly, there is statistical evidence of declining age specific mortality rate between 1996 and 2006 survey for both male and female respectively (the sign test,  $p = 0.062$  for men,  $p = 0.008$  for women,  $\alpha = 5\%$ ).

Table 2 presents adjusted mortality rate and confidence limit and comparative index for men and women of 15-49 yrs. It is known that men adult mortality rate was declined by 22.64 % (2.65 vs. 2.15) in the year 2001 in comparison to the year 1996. From comparative index, it was known that adjusted adult mortality rate for men and women in 2006 was declined by 18% and 43% as compared to 1996. Women mortality rate declined by 2.26 times when compared with men mortality rate in ten years period. There is evidence of statistical significance difference in adult mortality rates of men of 1996 and 2006 (Difference ( $R_1 - R_2$ ) = 0.55 >  $T_{cal} = 0.47$ ,  $P < 0.05$ ). A similar result was found for adult mortality rates of women of 1996 and 2006 (Difference ( $R_1 - R_2$ ) = 1.56 >  $T_{cal} = 0.48$ ,  $P < 0.05$ ).

**Table 1: Age Specific Mortality rates by Age, Sex, 1996- 2006**

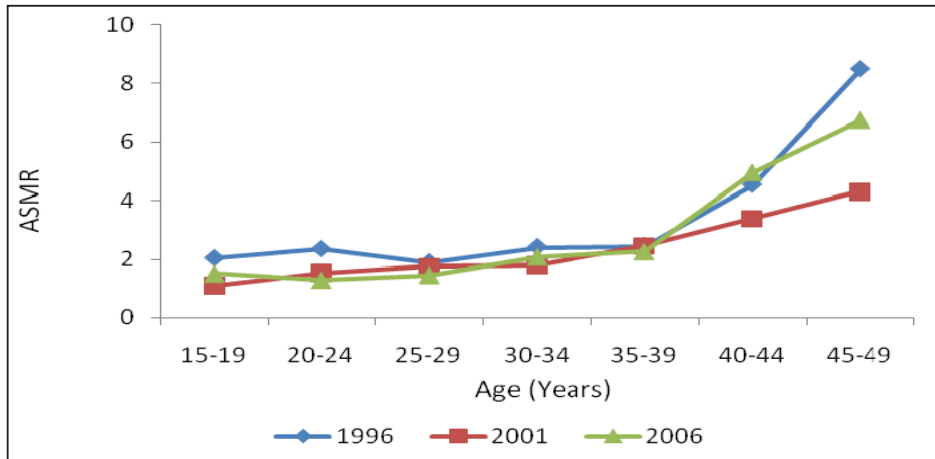
Year	1996			2001			2006		
Age	Deaths	Exposure	Mortality Rate	Deaths	Population Size	Mortality Rate	Deaths	Exposure	Mortality Rate
<b>Men</b>									
15-19	43	21134	2.03	1293	1185826	1.09	34	22341	1.52
20-24	52	22151	2.35	1449	946742	1.53	31	23855	1.30
25-29	37	19529	1.89	1429	821014	1.74	32	21713	1.47
30-34	38	15728	2.42	1303	726040	1.79	37	17737	2.09
35-39	28	11397	2.46	1594	651351	2.45	30	13243	2.27
40-44	34	7465	4.55	1828	539993	3.39	43	8672	4.96
45-49	38	4457	8.53	2027	469695	4.32	36	5337	6.75
<b>All 15-49</b>	<b>270</b>	<b>101861</b>	<b>2.65</b>	<b>10923</b>	<b>5340661</b>	<b>2.05</b>	<b>243</b>	<b>112898</b>	<b>2.15</b>
<b>Women</b>									
15-19	56	19627	2.85	1230	1203176	1.02	30	22263	1.35
20-24	47	20576	2.28	1298	1070026	1.21	23	23427	0.98
25-29	67	18107	3.70	1259	904464	1.39	40	20789	1.92
30-34	45	14556	3.09	1172	763463	1.54	39	17953	2.17
35-39	41	10818	3.79	1244	659302	1.89	35	13573	2.58
40-44	33	6513	5.07	1142	548051	2.08	28	8625	3.25
45-49	31	3964	7.82	1526	453678	3.36	22	4751	4.63
<b>All 15-49</b>	<b>320</b>	<b>94161</b>	<b>3.40</b>	<b>8871</b>	<b>5602160</b>	<b>1.58</b>	<b>217</b>	<b>111381</b>	<b>1.95</b>

Source: NFHS1996, Census 2001 &amp; NDHS 2006

**Table 2: Adjusted Mortality Rate\*, Confidence Limit and Comparative Mortality Index**

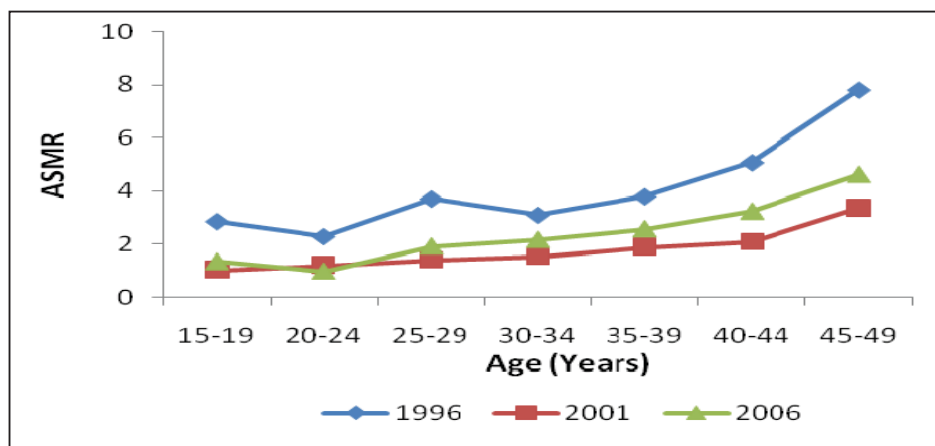
Variable	Year	Per 1000 population (15-49 yrs)	95 % Confidence Limit		Comparative Mortality Index (1996 vs 2006)	Test Statistic (T cal)
			Lower	Upper		
<b>Men</b>						
Adjusted Mortality Rate ( $R_1$ )	1996	2.99	2.93	3.04		
Crude Mortality Rate	2001	2.05				
Adjusted Mortality Rate( $R_2$ )	2006	2.45	2.41	2.48	0.82	
Difference ( $R_1 - R_2$ )		0.54				0.47**
<b>Women</b>						
Adjusted Mortality Rate ( $R_1$ )	1996	3.64	3.59	3.69		
Crude Mortality Rate	2001	3.36				
Adjusted Mortality Rate( $R_2$ )	2006	2.08	2.06	2.09	0.57	0.48**
Difference ( $R_1 - R_2$ )		1.56				

\* Used direct standardization method, taking 2001 census population (15-49yrs) standard population \*\* significance,  $\alpha = 5\%$



Source: NFHS1996, Census 2001 & NDHS 2006

**Fig 1:** Age Specific Mortality Rate for Adult Male Population in three different Surveys



**Fig 2:** Age Specific Mortality Rate for Adult women Population in three different Surveys

## Discussion

It was reported a large number of adult deaths globally are being caused by high blood pressure, cholesterol, and tobacco consumption<sup>12</sup>. In context of Nepal, the main causes of deaths are infections, parasitic diseases, perinatal and reproductive diseases. Ministry of Health of Nepal reported that infectious disease, maternal, perinatal and nutritional problems accounted for all 50% followed by 42% non communicable and congenital problems, 6% injuries and 2% unclassified. Overall two third of disability adjusted life years (DALY) are caused by infectious disease – the biggest killers of the poor. It was also reported that approximately 21.8% of total population of the country die before they reach age of 40<sup>13</sup>. It was also reported adult mortality rate of Nepal was highest in SAARC region (301 per 1000 Population). It was 16.21% and 41.31% higher than India and Sri- Lanka respectively. The life expectancy of Nepalese population was increased by 5% in the year

2006 (58 vs 63.3 yrs). It was ranked 33 in 2000 which was 1.4 times less than Japan and 1.04 times higher than Cambodia<sup>12</sup>.

From this study, it was known that adult mortality rate for men and women have been declining by 1% and 3.02 % per year in Nepal. It was also reported that adult mortality has been declining at a rate of 1 percent per year in case of men and 2 percent per year in women in many developing countries<sup>1</sup>. Similarly, among young adults (aged 19–44 years), women had a lower mortality risk (OR = 0.79, 95% CI = 0.72, 0.87)<sup>14</sup>. In Arabian countries, adult men mortality is higher than adult women mortality. Male-female differences in the probability of dying between the ages of 15 and 60 range from a minimum of 2 percentage points in Kuwait to a maximum of 9 percentage points in Sudan<sup>15</sup>.

From this study it was known that adult mortality rate was declined over ten years period in Nepal. It may be due to increase in access and improved health services. According to health statistics prior to starting of first five year plan in 1956 there were 34 hospitals with a total of 625 beds and 24 dispensaries. But now there are 4105 health institutions providing health services to 25 millions populations. Between 1995/96 and 2003/04 access to health services increased by 18%<sup>16-17</sup>.

Disease Eradication Programs (TB, Malaria, HIV/AIDS Leprosy, etc) is an important cause of rapid decline mortality rate in Nepal. About 45% of total population infected with TB of which 60% are of productive age group. 70% unidentified patients will be diagnosed and 85% of them will be diagnosed after the introduction of Multi Drug Therapy in the tenth health plan of Nepal (2002- 2007). Similarly, prevalence of Leprosy 21 per 10,000 in 1982 reduced by 90% in the year 2005<sup>18</sup>.

It was reported that more than 70000 people are suffering from HIV/AIDS at the end of the year 2005. Eight-one percent infected people are in the productive age group of 20 to 39 years. About 73% women and 92% men have heard about HIV/AIDS. HIV/AIDS and sexually transmitted diseases are emerging threats to adult population of Nepal which will affect the socioeconomic and health sectors<sup>7, 19</sup>.

Family Planning Services may be the important factor to reduce adult mortality rate in Nepal as contraceptive prevalence rate has increased by 18.2% in a decades (1996-2006). In same period, Total Fertility Rate was declined from 4.6 to 3.1 per 1000 women. These reduction data indicates the situation of women of reproductive age has been improved over a decade. In the same period, women receiving antenatal care increased from 4% to 44% in recent year. It was also known that malnourished Women (BMI < 18.5) decreased by 4% in the past decades from 28 % to the NFHS 1996 to 24% in the year 2006<sup>6, 7</sup>.

Many studies have found that education attainment has significant relationship with level of mortality. In 1991 census 39.6% Nepalese population were literate and the country's crude mortality rate was 13.3 per 1000 population. In 2006, crude mortality rate was 8.7% per 1000 population. It means when education status increased by 14.5%, crude mortality rate was declined by 34.58%. Similarly according to NHDS 2006 Survey showed that illiterate women led infant mortality rate 5.3 times higher than grade 10 or above education (69 vs 13 per 1000 live births)<sup>4, 6</sup>.

Many studies have found income level of Nepalese population is gradually increasing and they can

consume nutritious food as a of which result mortality rate declines. Average per capita income increased from Nepalese Rs. (NRs.) 7307 in 1995/96 to NRs 13946 in 2003/04. In same period per capita consumption has been increased from NRs. 7369 to NRs. 13,199<sup>20</sup>. The study conducted in India showed the odds of adult mortality in bottom quintile was 2.92 (95% CI =2.40-3.20) more than richest quintile<sup>14</sup>. In Yemen where purchasing power parity less than US\$ 1000 has the probability of dying for adult men and women was 78 and 71 per 1000 population while in Kuwait purchasing power parity more than US\$15,000 the probability of dying for men and women was 24 and 11 per 1000 population respectively<sup>15</sup>.

Finally, it is known that adult mortality rate is affected by several factors directly or indirectly. Therefore mortality information is necessary to emphasize the health services and to progress the socioeconomic conditions. Therefore reliable information on birth, death and diseases are useful for planning public policy and in the evaluation of health services which will be helpful to fulfil millennium development goal.

### Conclusion

This paper tries to reveal the importance of adult mortality rate of Nepal for health professionals and health policy makers. Though the study showed adult mortality is declining in Nepal but there is still need to address the pattern of adult mortality in Nepal by demographic characteristics, disease pattern, geographical variation, place of residence etc.

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