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Choice of providers for treating a neglected tropical disease: an empirical analysis of kala azar in Nepal

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ABSTRACT

Objective: To examine the choice of healthcare providers for treating kala azar (KA) in Nepal. **Methods:** Information was collected from clinically diagnosed KA patients seeking care from public hospitals located in KA endemic districts. The survey collected information from more than 25 percent of total KA cases in the country. For empirical estimation of probability of choosing a provider-type as a first contact healthcare provider, a multinomial logit model was defined with five alternative options with self care as the reference category. **Results:** The empirical model found that price of medical care services, income of households, knowledge of patients on KA and KA treatment, borrowing money, age of patient, perceived quality of provider types, *etc*. determine the likelihood of seeking care from the alternative options considered in the analysis. All variables have expected signs and are consistent with earlier studies. The price and income elasticity were found to be very high indicating that poorer households are very sensitive to price and income changes, even for a severe disease like KA. Using the empirical models, we have analyzed two policy instruments: demand side financing and interventions to improve the knowledge index about KA. **Conclusions:** Due to high price elasticity of KA care and high spillover effects of KA on the society, policy makers may consider demand side financing as an instrument to encourage utilization of public hospitals.

1. Introduction

Analysis of demand for health care for disease-specific services has a number of advantages. First, diseases vary widely in severity and medical interventions are not equally effective for all types of diseases and medical conditions. Considering all the diseases together can make demand analysis misleading due the aggregation of many different types. Second, a number of tropical diseases have their own peculiarities that require specific interventions for the control or elimination of the disease making these virtually independent medical commodities. Third, some of the diseases like kala azar (KA), is a disease of the poor[1,2] and treatment seeking behaviour of the poor and vulnerable people may differ significantly from others[3,4].

A number of research studies have been conducted to understand demand for medical care services in developing countries[5-12]. Despite, the interest in empirical demand analysis, econometric methodologies and findings have differed widely. Most analyses tend to simplify the demand analysis by assuming homogeneous "medical care services". Prices used in demand functions are often inadequate and do not represent the "prices" consumer's face. For example, some studies used standard fee schedule, some used expenditures per medical visit and few used hedonic prices[6-8,10-12]. Policy implications related to price and cost cannot be derived unless the empirical model use appropriate price measures. In addition to the price effects, other factors affecting demand for medical care are also crucial for designing effective health policy for developing countries. Although many of the tropical diseases are endemic in south Asia, disease specific demand analyses using regional data are still quite rare.

The paper is based on information collected in KA endemic areas of Nepal to explore the factors affecting utilization of KA services as well as differential effects of prices on demand for services by poor and non-poor households. This study has estimated a multinomial logit model to identify factors affecting consumer choice of alternative health care providers, namely public hospital,

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public clinics, private providers, drug stores and self care. Beyond the usual variables like prices of health care, income, knowledge and information, we also investigate a set of individual and household characteristics that may provide important insights into the potential opportunities and challenges of KA control policy.

2. Methods and materials

2.1. The utility structure and the empirical model

The behavioural model in this paper has been developed by adapting the models purposed in a number studies analyzing healthcare demand[7,8,10,11,13,14]. The utility function is derived as a function of health and consumption. In event of an illness, a KA patient decides the type of medical care she will consume. For deriving the theoretical underpinnings of the analysis, we can start from a general utility function u, which depends on health status (H) and consumption of goods (C) for the individual i. Therefore, in absence of any illness (say KA), the utility function can be written as

$$u_i=u(H_i, C_i) \quad (1)$$

With KA, utility function shifts downward and therefore,

$$u_i=a^j_k u(H_{ij}, C_{ij}) \quad (2)$$

Where, $\{a^j_k\}$ value of a_k when jth type of care is used, $0<a^j_k \leqslant 1$ and the value of it depends upon the severity of illness. After successful treatment of KA, value of a_k will become equal to 1.0 so that the utility function shifts back to the original level. Note that the choice of providers affect utility in two different ways: first, by shifting the utility function as the severity of the disease declines and second, by affecting health status and consumption. It is assumed that the utility function satisfies strict convexity condition.

$$U_c>0,\ U_{cc}<0,\ U_H>0,\ U_{HH}<0$$

Therefore, health status of a consumer with KA depends on the type of treatment services (M) received as well as individual and provider related characteristics (X).

$$H_i=H(M_1, M_2 \cdots M_j, X_i) \quad (3)$$

The health production function exhibits $H_m>0$, $H_{mm}<0$. The consumer receives income from total working time multiplied by wage rate and other sources like unearned income and transfer payments. Thus total income of the consumer can be expressed as:

$$Y_i=\delta A_i+\omega T_i \quad (4)$$

Where, δ is flow of income from other sources such as assets or home production (A) of an individual consumer, ω is the wage rate, T is total working time for an individual consumer. The consumer allocates her total budget for health care and consumption of goods and services. Therefore, monetary value of consumption of non health care goods and services can be written as:

$$C_{ij}=Y_i-P_{ij} \quad (5)$$

Where, C_{ij} is the monetary value of resources that consumer spends on a composite commodity which includes all goods and services excluding health care received from provider type j. P_{ij} is the value of resources that individual consumer devotes to receive the medical care from health provider j. The equations (3) and (5) suggest that consumption of non health care goods and services, the attributes of the health care provider choices and the characteristics of the decision maker enter the utility function shown in equation (2). Since we are modelling discrete choice of types of healthcare providers, the utility function should be expressed as random utility for empirical estimation. By definition, random utility has two components: deterministic component V and a random component ε. The random utility function can be written as:

$$U_{ij}=V_{ij}+\varepsilon_{ij} \quad (6)$$

The individual consumer selects the health care provider j that maximizes her utility. In empirical estimation, assumptions on the distribution of the disturbances lead to various estimable discrete choice models like probit and logit. The random utility model can further be simplified by assuming additive separability of utility arguments. Therefore, the utility function (3) and (5) can be written as,

$$U_{ij}=a^j_k\{f(Y_i-P_{ij})+H(M_{ij}, X_i)\}+\varepsilon_{ij} \quad (7)$$

In this formulation, utility is a function of net income (Y_i-P_{ij}) after paying for health care provider j and health production function $H(M_{ij}, X_i)$ that depends upon attributes of health care provider choices and decision makers. Presence of α in the equation should not pose a problem as α is affected by provider attributes, which are already included to explain the health status H.

For empirical specification, following Sahn[10], we can assume that the health production function $H(M_{ij}, X_i)$ is linear in M and X. The set of X includes individual and household characteristics. The variable Mij are related to quality of medical care as perceived by consumers. Although the standard care for KA is available only in public hospitals in Nepal, we cannot assume that the characteristics of other types of health care providers will not affect the health status of KA patients[8,10]. Use of non-standard care types may help KA patients in reducing pain and suffering, or help in the diagnosis of the disease. Thus, the provider characteristics may reflect some aspects of quality but, in general, quality of services is treated as unobserved, similar to a number of previous studies[7,10,13].

For specifying the empirical equation, we again follow a number of previous studies to define the function $f(\cdot)$ in equation (7) as an additive function of log of net consumption and square of log of net consumption (function of prices and income in quadratic form). The quadratic functional form allows the possibility that higher-income consumers may choose high price-high quality options compared to relatively low-income consumers. Therefore, in quadratic form, we can write:

$$f(Y_i-P_{ij})=\beta_1\{ln(Y_i-P_{ij})\}+\beta_2[ln(Y_i-P_{ij})]^2.$$

For discrete choice problems, consumers compare the expected utility of any option j with the utility derived from "reference" option so that the difference in utility values between the two options (Vj-Vo) helps the consumer to select the best option. For price and income variables (ignoring α in the equation), difference between two options can be expressed as (see Sahn[10]):

$$V_j-V_0=\beta_1\times\{ln(Y_i)-P_{ij}/Y_i\}+\beta_2[\{ln(Y_i)\}^2-2ln(Y_i)(P_{ij}/Y_i)]+[H(M_{ij}, X_i)-H(M_{i0}-X_i)]$$

Note that this type of discrete choice demand function may be estimated by using Multinomial Logit (MNL) or Nested logit Model (NLM). The MNL model is relatively robust[15,16] and in this analysis we have used the MNL model for our empirical estimation.

2.2. Sample size and data collection

This study uses cross sectional data collected from KA patients in Nepal. Both qualitative and quantitative methods were used to collect data from patients and their household

members. The purpose of mixing the qualitative and quantitative study design is to produce a better picture of KA situation in endemic regions of the country and to generate information for developing and designing of the survey questionnaires. The qualitative methods were also used to better understand the decision making steps and processes KA patients follow in selecting the healthcare option from various options available in the community.

The quantitative data were collected using a structured questionnaire which included questions on various factors affecting demand by care and choice of providers. The questionnaire asked patients about the origin and progression of illness, visits to providers, cost of care, transportation cost, opportunity cost, knowledge about KA and KA treatment, income of the household, whether borrowed money to pay for healthcare costs, various socio-demographic characteristics of the patient and the household. To ensure quality of data collected, rigorous mechanism were in place at all stages of the survey and data collection. Questionnaires were designed in a way so that all the questions are in a logical order, easy to understand and phrased in local language.

Data on self reported incidence of illness and health status are subject to significant errors in reporting or systematic bias[17-20]. Health care costs are also often reported with relatively high recall bias[2,21]. To minimize these problems, we have decided to collect data from all KA patients showing up in the district hospitals. In Nepal, more than 80% of KA patients seek care from district hospitals at some point of the disease stage. Therefore, collecting information from hospital based patients will have relatively low selection bias, if any. The advantage of this type of survey is that there is no uncertainty or recall bias about the disease; only the patients who tested positive for KA in the hospital were interviewed.

For this study, data were collected from clinically confirmed KA patients seeking care from six hospitals located in five high prevalence KA districts of Nepal. Consumers who sought care for any reason from outpatient facilities of the hospitals during the period October 2008 to December 2008 constituted the sampling frame for the study. When a KA case was clinically confirmed, the field researchers contacted the patient immediately to start collecting data on the disease, its progression, and the history of healthcare service use. During the three months of data collection, the study successfully collected information from 367 KA subjects out of 379 KA cases seeking care from these six hospitals. Note that the survey collected information from more than 25 percent of all KA cases in the country for the year 2007-2008 (1 371 cases were reported for 2007/2008)[22].

The ethical clearance for this study was obtained from WHO/TDR, Geneva and Nepal Health Research Council, Kathmandu, Nepal. The researcher began interview with a general introduction and greeting process to build rapport and promote a relaxed and informal atmosphere. Then researcher read thoroughly consent form and consent certificate and requested to the participants provide consent for survey, if they agreed, survey procedure had proceed, if they did not agree to provide consent for survey, we dropped the procedure.

3. Results

3.1. Descriptive statistics

For the empirical analysis, all KA service providers are categorized into five provider-types to define the dependent variable of the demand model. The choices or options are: self-care, drug store, public clinic, private clinic/hospitals and public hospitals. Actions taken by individuals or family members in response to illnesses are considered "self care". Self-care includes various types of home-based care, use of homemade traditional medicine, consultation with traditional healers, getting traditional medicines from the market, *etc*. Public clinic providers in Nepal are the sub-health posts, health posts and primary health care centers. Private providers include clinic service providers, private hospitals and nursing homes. Drug store is also an important source of care. Patients often obtain drugs directly from the drug store at the recommendation of the store personnel. Public hospital providers are the district and zonal hospitals.

Individual characteristics, such as age, sex, health status, belief system and health needs affect demand for healthcare services. It is usually assumed that there exists a u-shaped relationship between health care use and age[6]. Perceived need of health services (health status) is a subjective evaluation of individual's physical symptoms or health status. If the patients feel that the need for healthcare is high, they are more likely to seek care from outside sources. Similarly, likelihood of obtaining care from healthcare providers will be higher if the self-reported health status is categorized as "severe". Perceptions of the respondent about their risk of contracting KA and attitude or beliefs related to modern health care services are defined as binary or categorical variables.

In developing countries, estimating the prices of healthcare services is often quite problematic. Transportation and other related costs, in many cases, far exceed the actual out-of-pocket fee charged by health facilities. In most of the previous studies, prices of medical care were estimated using very narrow definition of cost. Unlike the previous studies, we have collected detailed information on cost components so that full price of medical care options can be derived. Therefore, price of health care have been calculated by including costs of medical care services, drugs, transportation, travel time, waiting time, unofficial charges such as tips and bribes, *etc*. Most of these cost items are available in monetary terms but travel time and waiting time require conversion of time into money values. In most cases, two alternative approaches can be used for valuing time of individuals[23,24]. In this analysis, we have used opportunity cost method to estimate the monetary value of time[22,25]. The opportunity cost of time is defined by market wage rate, or in absence of wage information, minimum wage rate set by the government can be used as a proxy.

Knowledge about health and disease is an important factor affecting the decision making of consumers[26]. Poorly informed consumers may underestimate the marginal benefit of prevention and treatment. Individuals receive health information from various sources such as radio, television, poster, *etc*. on symptoms of disease, disease vectors, preventive and curative measures. Since health information is of various types, the degree of health knowledge of an

individual can be measured by obtaining data on signs and symptoms of disease, sources of information on the disease, service availability, mode of transmission, preventive approaches, *etc*. For constructing the knowledge index, we have assigned one point for each of the correct responses and negative one point for each wrong answer. Sum of all the points define the knowledge index. Individuals who answered all the questions correctly receive a score of 38 and who provided all incorrect answers receive −38. Therefore, the knowledge index ranges from +38 to −38.

Table 1 reports the descriptive statistics of the variables included in the empirical model. Note that self care was the choice of about one-fourth of all KA patients in the sample, followed by drug store as the first contact healthcare provider. Only 16 percent patients sought care from the public hospitals as the first contact provider. It is interesting that more than 80% of households reported borrowing money for the treatment of KA, although the KA care is provided free of charge at public hospitals. In our sample, about 50% of patients are from disadvantaged ethnic groups. Almost 60 percent patients reported that the reason for the choice of service provider was the quality of services rendered. Only 34 percent of the patients had favorable or positive attitude towards modern public facilities, particularly hospital care. More than 50 percent reported that they were aware of their relatively high risk of contracting the disease.

3.2. Maximum likelihood estimation

The results of the multinomial logistic model are reported in Table 2. The estimated coefficients suggest that prices incurred for accessing healthcare and household income significantly affect the decision making on the choice of providers. The higher is the price associated with obtaining care from a provider-type, the less likely are the patients to seek care from the type compared to self care. The patients from higher income households are more likely to utilize any type of health care facilities compared to self care. Patients who have better knowledge about KA and its prognosis are more likely to utilize public hospitals. The positive attitude of patients towards modern western care in the treatment of KA (compared to the base category that modern western care is not effective) increases the probability of using public hospitals. The household with higher family size is less likely to utilize the public hospital.

Education does not seem to be associated with the use of public hospitals and clinics. People living with poor health status are more likely to use public facilities than the individuals who report their health status as moderate. Disadvantaged population groups are less likely to use public hospital, although the coefficient is marginally significant. The empirical estimation indicates that patients who need loans for the treatment of KA are less likely to visit public health services, although the KA services are provided free. Clearly, cost of accessing services from public hospitals is relatively high due to relatively high distance from KA patient residences. Perceived good quality of provider-type also affects the likelihood of seeking care from the type. The belief system is also an important determinant of obtaining care from public hospitals.

The statistical tests related to model fitting and diagnostics are quite encouraging. Pseudo R^2 is found to be high and Hausman test has confirmed that there is no significant IIA problem in the model. Most of the estimated coefficients are statistically significant and are of expected signs. Wald test, a diagnostic test for identifying the influence of omitted variables, indicates that omitted variable bias may not be an important concern for the model.

3.3. Elasticity

From the regression coefficients reported in Table 2, elasticity values can be estimated at the mean or at the median values of the independent variables. Since median would be a better reflection of changes expected due to changes in price and income, median values were used to calculate the elasticities. Table 3 reports the estimates of own price and income elasticity of demand derived from the coefficients estimated for the choice model. The results indicate that services of public hospitals and private providers are highly price elastic. A one percent increase in the full price of public hospital or private provider services reduces the use of the provider-types by about 8%. Income effect is also quite high and almost similar for both public and private health care services. If income is increased by one percent, demand for public hospital medical care is expected to increase by about 9% on the average. The

Table 1

Descriptive statistics for the variables used in demand analysis (n=367).

Variables	Category	*Mean*	*Std.Dev.*	*Min*	*Max*
Log of consumption (price)	Continuous	0.02	0.03	0.00*	0.16
Log cons. square (income)	Continuous	0.43	0.50	0.00*	2.84
Disadvantaged groups	Dummy	0.49	0.50	0.00	1.00
Household size	Continuous	6.58	2.42	2.00	20.00
Age of consumer	Continuous	23.68	16.51	2.00	80.00
Square of age	Continuous	832.52	1 026.65	4.00	6 400.00
Male	Dummy	0.58	0.49	0.00	1.00
Highest educational level	Continuous	3.76	3.84	0.00	15.00
Knowledge index	Continuous	9.17	12.03	−20.00	36.00
Borrowed money	Dummy	0.84	0.37	0.00	1.00
Quality service as reason	Dummy	0.58	0.49	0.00	1.00
Health status severe	Dummy	0.45	0.50	0.00	1.00
Positive attitude (belief)	Dummy	0.34	0.47	0.00	1.00
Perceived risk of KA	Dummy	0.56	0.50	0.00	1.00

*Numbers became very close to zero after logarithmic transformation. Source: Survey of kala azar patients in the district hospitals.

Table 2
Factors affecting choice of provider type by KA patients in Nepal–Results of the multinomial logit model.

Variables	Coefficienfs(Std. Err.)			
	Drug stores	Private providers	Public clinics	Public hospitals
Log consumption	−10 001.38(2 227.31)*	−10 638.31(2 230.36)*	−9 714.54(2 225.28)*	−10 640.41(2 236.65)*
Log consumption square	583.76(126.751 1)*	621.76(126.926 4)*	567.24(126.632 6)*	620.74(127.278 8)*
Disadvantaged group	−0.12(0.776 7)	−1.06(0.855 1)	−0.51(0.775 4)	−1.80(1.112 8)***
Household size	−0.02(0.197 3)	0.11(0.208 8)	0.10(0.196 4)	−0.59(0.272 9)**
Age	−0.12(0.076 4)***	−0.11(0.086 1)	−0.07(0.081 2)	−0.17(0.099 4)***
Age square	0.00(0.001 1)**	0.00(0.001 3)	0.00(0.001 2)	0.00(0.001 5)
Male	−0.36(0.782 2)	−0.25(0.848 0)	−0.44(0.775 8)	−0.24(1.015 9)
Highest education	−0.05(0.118 7)	−0.06(0.127 1)	−0.09(0.118 1)	0.00(0.143 5)
Index of knowledge about KA	0.05(0.037 6)	0.05(0.040 2)	0.08(0.037 3)**	0.16(0.049 8)*
Borrowed money	−19.70(2.848 3)*	−19.43(2.941 2)*	−19.30(2.917 8)*	−24.91(2.771 0)*
Quality as the reason for choice	−0.31(0.775 2)	1.54(0.867 6)	0.57(0.767 2)	3.18(1.178 2)*
Severe health status	0.40(0.840 8)	1.62(0.915 7)	0.14(0.841 5)	0.97(1.075 6)
Positive attitude towards modern care	1.52(0.909 1)***	1.34(0.977 0)	1.72(0.896 2)***	2.74(1.108 7)*
Risk of KA	−0.27(0.931 6)	0.89(1.001 4)	0.49(0.936 1)	1.35(1.181 0)
Constant	14.87(2.071 0)*	9.20(2.176 4)*	13.17*(2.184 7)	14.81(dropped)
LR (56)	691.69		Number of iterations=19	
Prob. > χ^2	0.00		Hausman test of IIA	
Pseudo R^2	0.59		$\chi^2(8) = 50.87$	
Log likelihood	−241.48		Prob> $\chi^2 = 0.00$	

*Significant at 1% level, **significant at 5 % level ***significant at 10 % level. (Reference category=self or home care).

elasticity numbers are quite unexpected for public clinic services. Utilization of public clinics decline with the increase in income and the price effect for the public clinic services is also found to be positive. It appears that public clinics in Nepal are considered inferior by KA patients. Similarly, price elasticity is positive for drug store while the income elasticity is negative. For both these sources of care, public clinic and drug store, the negative income effect is so large that the price effect becomes positive.

3.4. Policy simulations

Using the results reported above, we can conduct a number of policy simulations. In this section, we analyze two short term policy instruments to encourage the use of public facilities for KA patients. These two policy options are: a) introduction of demand side financing; and b) improving knowledge about KA. The demand side financing (DSF) mechanism provides money to patients to encourage utilization of desired medical care services. The introduction of DSF for KA care is logical because the use of the standard care provided through the public hospitals appear to be highly price elastic. In recent years, Government of Nepal is planning to implement demand side financing for KA care services. Another variable found to be important in our empirical analysis is the knowledge index for KA patients or their family members. We use these two policy instruments to simulate the *ceteris paribus* effect of these policies on the use of public hospitals for the treatment of KA.

3.4.1. Demand side financing

DSF or direct cash payment to the KA patients for accessing services from public hospitals can help improve the choice of appropriate kind of medical intervention. How successful a DSF program would be will depend on the type of incentives adopted, *i.e.*, whether the DSF increases the income of households or reduces the full price of the desirable medical care options or both. Given that the price elasticity of public hospital use is very high, subsidizing the travel cost plus reimbursement for the time spent in travelling and waiting will increase the utilization of public hospitals at a relatively high rate. Note that the demand side financing will improve the utilization of public hospitals not only through the price effect but also through the income and borrowing effects.

For simulation purpose, we introduce five levels of cash transfer to those who seek care from public hospitals. The levels of cash transfers are: 200 Nepalese Rupees (NRs), 500 NRs, 700 NRs, 1 000 NRs, and 1 500 NRs. Therefore, demand for healthcare services will be affected through the changes in the price faced by patients at district hospitals and increase in income due to cash transfers. Reduction in the price of public hospital services will shift some patients away from self care to hospital care at the margin. As long as the cash transfer is less than the full price, changes in demand will be influenced by the price effects. If the cash transfer is greater than the full price, the excess cash will increase income of households and will create an additional income effect.

The results suggest that even with relatively high levels of cash transfer, utilization of public hospitals is unlikely to exceed the 63 percent level. In fact, 63% rate of utilization is achieved at the cash transfer level of 700 NRs. This implies that the DSF should be able to attract almost all KA patients willing to visit district hospitals for KA treatment by providing 700 NRs per case. Higher cash transfer will have relatively small impact on public hospital utilization rate. Note that utilization will continuously increase through income effects but the effect of income on utilization rate is relatively small. The predicted probabilities due to the introduction of DSF are given in Table 4.

3.4.2. Knowledge on KA

To simulate the changes in knowledge index, average knowledge index was set at the levels 20, 25, 30, and 35. As mentioned earlier, the highest value of knowldege index has

been defined as 36. In the multinomial choice regression model, knowldege index was important in the choice of all the healthcare alternatives. Therefore, changes in knowledge index will affect utilization of all types of medical care services. Table 5 reports the predicted probability of choice of providers due to improvement in the knolwdege index from 20 points to 35 points.

The results in Table 5 imply that improvement in knowledge index reduces the likely of using self-care or home care. Use of drug stores and private clinics also decline with better knowledge, although the effect is very small. Better knowledge about the disease and its treatment does improve the utilization of public hospitals. Therefore, strengthening the health education program related to KA should have significant impact on the utilization of most desirable source of KA treatment, the public hospitals.

4. Discussion

In this paper, we have used a demand framework widely used in the literature to analyze the demand for health care by KA patients. In general, the KA patients are relatively poor in the community and in our sample 90% of the KA patients belonged to poor households (households below the official poverty line). Most of the KA patients live in rural areas but the recommended treatment is available only in urban district hospitals, creating significant access problems for the KA patients in Nepal. To estimate a model to explain the choice of healthcare providers, we have used the standard MNL regression with five alternative options. One of the potential problems of using multinomial logistic model is the assumption of IIA and Hausman test indicates that there is no significant IIA problem in the model.

The regression results indicate that prices of healthcare options, income of households, knowledge of KA, borrowing money for treatment, caste and other minority status, age of the person, perceived quality of services provided, trust in public hospitals, *etc*. affect the demand for health care. The coefficients of all the variables considered in the model are of expected signs. Our result is consistent with other studies that improved knowledge about the disease increases the utilization of desired type of health care facilities. Lack of information often leads to wrong decisions, which may adversely affect health outcomes and wellbeing of consumers.

Socio-demographic variables like age and gender of patients, household size, education, belief system, *etc*., affect the choice of healthcare types but the directions of the effects cannot be defined by apriori considerations. The directions of the effects depend upon the nature of the study, illness being considered, severity of symptoms and probability of survival. In our study, there was no effect of education on health care utilization. The reason for this unexpected result could be because of the low educational attainments of KA patients in general. Most of the KA patients and their family members are either illiterate or have less than five years of education.

In developing countries, borrowing money to finance health expenses is very common[2,27]. Lack of financial resources directly influences utilization of healthcare services. We find that borrowing money for the treatment of KA significantly lowers the likelihood of seeking care from public hospitals. In many empirical studies, information on borrowing for paying healthcare expenses is not considered and therefore, in many cases, empirical studies underestimate the total cost of healthcare services. Most studies concentrate on the impact of user fees on utilization but taking out a loan to pay for medical care services adds additional expenses with the user fees and has longer term impacts on economic and

Table 3
Own price elasticity of demand and income elasticity.

Variables	Public hospital	Public clinic	Private provider	Drug Store
Price	−8.04*	3.88*	−8.01*	6.37*
Income	9.25*	−4.56*	9.51*	−16.11*

*1% level of significant.

Table 4
Effect of cash transfer on probability of utilizing public hospital.

Price and income effects of transfers		Assumed cash transfer levels under demand side financing (NRs)				
		200	500	700	1 000	1 500
Baseline (0.16)	Price effect	0.20	0.35	0.63	0.63	0.63
	Income effect	0.18	0.20	0.22	0.24	0.28

Table 5
Effects of knowledge about KA on the choice of health care providers.

Value of the knowledge index	Healthcare options available to KA patients				
	Self care	Drugstore	Private provider	Public clinic	Public hospital
Baseline probability of seeking care from	0.23	0.22	0.20	0.19	0.16
Elasticity with respect to knowledge index	−0.55	−0.11	−0.08	0.15	0.94
Information 20 points	0.14	0.20	0.19	0.22	0.32
Information 25 points	0.12	0.20	0.18	0.22	0.35
Information 30 points	0.11	0.20	0.18	0.22	0.37
Information 35 points	0.10	0.19	0.18	0.23	0.39

social wellbeing of the household[2,27].

Most of the households in our sample are extremely poor and poor individuals are likely to be more price sensitive[3,24]. We find that the absolute values of price and income elasticity are relatively large. Given that we have considered five alternatives in the model, we expected relatively high elasticity numbers. However, the elasticity numbers are very high, probably because of the very low income levels of the households in the sample as well as our use of full price as the measure of medical care costs. Full price is calculated by adding the various cost items like cost of medical care and drugs, transportation cost and opportunity cost of time. A number of studies[5-9] have used official price of services ignoring other cost items and in one case (Sahn *et al*[10]), the researchers have used opportunity cost of time only for approximate the cost of seeking medical care. Therefore, our study has used more realistic measure of cost or price. Official prices of many health services are almost zero in many developing countries of the world but households spend quite significant amount of resources for receiving the services. In many cases, informal payment is high in many public facilities.

Due to high price elasticity of KA care and high spillover effects of KA on the society, policy makers may consider demand side financing (DSF) as an instrument to encourage utilization of public hospitals. We analyzed introduction of DSF with different levels of monetary incentives. The results suggest that it is difficult to change the behaviour of people who consult drug store or other lower-level facilities through the incentive mechanism created by DSF. The incentives will significantly lower the use of self care and increase the utilization of public hospitals. Similarly, we have used knowledge index as another policy variable. In a poor developing country, knowledge about the illness can be improved significantly through health education interventions. If knowledge indices can be improved, the use of public hospitals will also increase significantly.

Conflict of interest statement

We declare that we have no conflict of interest.

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