Socio-Economical Determinants of Kala-azar in Nepal

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Abstract

Introduction Kala-azar (KA; *Visceral Leishmanasis*), caused by sandfly *(Phlebotomus argentipes)* feeding on human blood, is both devastating and impoverishing and threatens almost one quarter of Nepal's population. The disease has its roots in the socio-economic, behavioural, cultural and environmental factors that prevent the population at risk from adopting measures to avoid human-sandfly contact.

Objectives The paper analyzes the socioeconomic attributes and treatment seeking of selected KA households in Siraha and Saptari districts with the aim of contributing to appropriate policy formulation for a more informed and robust response to KA.

Methods The analysis is based mainly on primary data collected through structured questionnaires from 61 KA households identified through a multi-stage random sampling process, and focus group discussions with KA community members and health workers.

Results KA affected districts lag behind the national average in terms of various socio-economic indicators that have been associated with a risk of contracting KA. There is high inequality in household income, cost of treatment, access to education etc among KA housholds. Further, the Dalits, who were socially and economically disadvantaged with high illiteracy and poverty, suffered greater work days lost and cost of treatment from an episode of KA compared to their non-Dalit counterparts.

Conclusion KA transmission can be avoided only through broad based development that encompasses improvement in all aspects of life supplemented by functional literacy and active case detection through community outreach activities. Preferential discrimination in treatment of KA at public hospitals could help to reduce economic burden among marginalized groups of people.

Keywords Kala-azar, Socio-economic, Opportunity cost, Economic burden

Introduction

Nepal borders with Uttar Pradesh and Bihar states of India along the tropical climatic zone that is afflicted by a wide variety of endemic tropical diseases such as Malaria, Kala-azar, Encephalitis etc. The wet paddy fields, tropical forest, close settlements, free and unrestricted human movement across the border contributes to the incidence of these diseases. This paper focuses on the communicable disease Kala-azar (KA; *Visceral Leishmanasis;* see endnote A) which threatens almost one quarter of the country's population[1], and is both devastating and impoverishing, with those in lower socioeconomic classes bearing the greatest burden of disease (see endnote B)[2,3,4]. His Majesty's Government of Nepal (HMG/N) has acknowledged the necessity of maintaining a healthy population as a means of poverty alleviation and,[5] in this regard, has initiated measures for the control of KA and abatement of its disastrous effects on the households (HH; see endnote C) since the first KA case was identified in the country in 1980 (see endnote D)[6]. While these measures may have had some success, recent data suggests that the incidence of KA is increasing (see endnote E)[7]. Furthermore, it has been felt that simply addressing the disease from an epidemiological level has been insufficient, and that effective programs should take into account both the socio-economic and behavioural factors of the KA susceptible household[8].

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In this regard, this paper attempts to elucidate the relationship between these socio-economic and behavioural factors, along with environmental data, and the burden and care of KA with the aim of contributing towards appropriate policy formulation for a more informed and robust response to KA.

The limitations of this paper are that it is based on a small sample size; it cover only those KA HHs who received treatment from public health facility and; lacks comparison from the case-control approach due to the prior design of the study.

Methods

The data utilized by this paper is from a recently completed WHO-TDR research project by the Nepal Health Economics Association (NHEA) entitled "Access to information, prevention and therapy of Kala-azar and its economic impact on the Households of Nepal"(see endnote F)[9]. The research project selected Saptari district due to it having the highest case fatality rate among the thirteen endemic districts (Bista et. al, 2004), along with the adjoining endemic district of Siraha (see endnote G). The population of KA patients was determined in both districts by examining the list of admitted KA patients in district hospitals, the only health institutions that treat KA, from April to November 2003. The eight-month period was chosen to coincide with the KA season in order to limit recall bias. A fifty percent random sampling was taken from the population of KA patients, which had been grouped and selected by their residence in Village Development Committees (VDC) having more than 3 KA cases. A high dispersion of KA HH; low probability of finding the KA patient, HH head and caretaker for accuracy and verification of information during interview and incomplete hospital records particularly regarding child patients compelled the study team to sample KA patients from clusters with greater probability of finding respondents and to narrow down the sample size. A total of 61 HH were interviewed in February 2004 utilizing structured questionnaires.

In addition to structured questionnaires, Focus Group Discussions (FGDs) were conducted at the community level, comprising of KA HH heads or caretakers, local leaders, social workers, and school teachers, all of whom were directly or indirectly involved in KA prevention, therapy and information. FGDs at the health professional level comprised of public hospital superintendents, doctors, nurses and paramedical staffs, private sector doctors, etc. involved in KA treatment.

The ethical approval was obtained form the Ethical Review Board of the Institute of Medicine, Tribhuvan University, Nepal. Informed consent from the concerned KA households was obtained prior to collecting information to cover socio-economic aspects related to KA knowledge, prevention and therapy, which included demography, income, education, cost of treatment, etc. Information on HH income from all sources such as agriculture, labour earnings, business etc. for one annual income cycle (January-December, 2003) was used. Simple descriptive as well as correlations between variables were examined to analyse the various indicative relationships. The data were also categorized into income quintiles to examine equity in access to information, prevention and therapy for various income groups.

Results

The socio-economic results have been discussed at two levels: firstly through secondary data at the national, Terai region and district levels; and secondly the socio-economic and behavioural data on KA HH collected in the course of the study:

National, Terai Region and District level: The recently published data on socioeconomic indicators provided by the Nepal Human Development Report 2004 reflecting data collected in the year 2001was used to analyse the socio-economic situation of the study area[10]. As our study collected data in 2003, there is a two year time difference to be considered in the comparison of our data with that of this secondary data.

Siraha and Saptari are adjoining districts in the south eastern plains of Nepal bordering the Bihar state of India. The area is characterized by tropical landscape, climate and vegetation. Siraha and Saptari districts (SSD) have an elevation ranging from 60 - 895 metres above sea level[11]. The various socio-economic indicators for Siraha and Saptari district are given in Table No. 1. Since the SSD lies in plain lands at a low elevation, the topography does not create a great barrier in transportation and communication, as exists in the difficult terrains of the hills and mountains in the northern part of the country. Relatively better access to transportation in the plains, at least during the dry months, has played some favourable role in economic and social lives of the people in SSD.

The Terai region refers to a distinct ecological and geographical region characterized by low lying plain lands (less than 300 metres elevation above sea level) and tropical climate in the southern part of Nepal. The Terai plain stretches throughout the entire length of Nepal, about 500 kilometres, with varying breadths. Malaria is quite common throughout the Terai region while tropical diseases like KA and Japanese

Encephalitis are more localized in the eastern and western Terai respectively. A comparison of the HDR, 2004 data for the Terai region with national averages revealed that major health related indicators such as life expectancy at birth, Infant mortality rate (IMR), malnourished children under age five, population with access to safe drinking water, access to sanitation were high for the Terai compared to the national average.

The Terai however lags behind the national scenario in terms of other vital socio-economic indicators such as adult literacy, particularly female literacy, mean years of schooling, access to radio, Gini coefficient (see endnote H) for land holding and GDP per capita (Table 1)

Table 1 A comparison of socio-economic indicators

Socioeconomic indicators	*Nepal*	*Terai Region*	*SSD Area*	
			Siraha	*Saptari*
Life expectancy at birth	60.96	63.95	63.38	63.13
literacy status (male)	62.7	59.0	49.7	60.0
(female)	34.9	32.8	19.2	27.6
Mean years of schooling	2.75	2.54	2.06	2.52
Infant mortality rate (IMR)	68.51	59.76	56.69	57.72
Malnourished children under age 5	50.51	47.1	52.35	44.0
Population without access to safe drinking water	20.48	12.10	11.91	5.79
Population with access to sanitation	39.22	27.15	9.04	9.81
Population with access to radio	52.59	42.39	34.6	36.23
Gini coefficient for land holding	0.544	0.569	0.551	0.560
GDP per capita (PPP US$)*	1310	1235	880	939
GDP per capita in Rs. At market price	17722	16713	11900	12703

*PPP US $: Purchasing Power Parity in US dollars

The relative geographical accessibility and better access to safe drinking water are believed to have manifested itself in reduced IMR in the Terai region compared to the national average. All the districts in the Terai have access by road and shallow tube-wells are a cheap source of drinking water to the inhabitants in the Terai.

The two study districts performed better vis-à-vis the overall scenario for the Terai region in terms of IMR, access to safe drinking water and Gini coefficient for land holding but lagged behind in female literacy, access to sanitation, access to radio and GDP per capita.

Siraha district lagged behind Saptari district as such too. The KA incidence in the districts also needs to be examined in the light of the backwardness in these socio-economic indicators. About two-third of the total KA patients in the SSD were of the most productive age group population, which would have a significant impact on the income of the HH[12]. Regarding other aspects of health, the four most important causes of morbidity in the SSD based on hospital records were skin diseases, diarrhoeal diseases, ear infections and

and poorly ventilated houses constructed from mud and sticks, which are prone to cracks, crevices and rat holes. These houses were built in clusters making the location congested, with the animals kept inside or in nearby sheds increasing the chances of human sandfly contact[13]. The hot and humid climate, combined with inadequate clothing make the residents of these dwellings inviting victims to sandfly bites.

The identified KA HH had a total population of 451 with 243 male and 208 females. The median HH size was 7 persons, with 4 males and 3 females. The population below 15 years constituted 41.13 percent, while the population above 60 years was 5 percent, with 54.54 percent in the economically active age group. The age of the patients ranged from 2 to 70 years, with 23 percent of the patients below 15 years of age and 1.6 percent above 60 years. Thus, three-fourths of the total KA patient population belonged to the economically active age group. The dependency ratio (the ratio between dependent population and working age population) was 0.83, implying that each working age population had to support almost one other dependent

Table 2 Socio-economic attributes of KA HH

S. No.	Socio economic Attributes of KA HH	
1.	Median HH size	7 persons
2.	Age of patient (range)	2-70 years
3.	Dependency ratio	0.83
4.	Nuclear/ Joint family ratio	1.11
5.	Literacy ratio: Male	48.9
	Female	25.9
6.	Literacy among Dalits: Male	23.0
	Female	11.1

In terms of ethnic distribution, the Chaudhary (Tharus) constituted 23 percent followed by Sada (Musahar) 16.4 percent, Muslims 8.2 percent, Chamar 6.6 percent and others. The proportion of the HH belonging to the Dalits (see endnote I) as classified by the population monograph (CBS, 2004) was 44.3 percent. The Dalits constitute 12.23 percent of the national population according to census 2001[14]. Among the 61 HHs, 16 HH (26.2%) had no literate members, while the remaining HHs had members with varying levels of literacy. The overall literacy rate (in the population 6 years and above) was 38.0 percent, with literacy for the male population (48.9%) almost double compared to the female (25.9%). There was stark inequality in the literacy status among the Dalit and the non-Dalits. Only 19 percent of the Dalits were literate, while this figure was 52 percent for non-Dalits. Female literacy was particularly low among the Dalits (11.1%), with literacy among non-Dalit females three times as high (38%).

The major occupations of the KA HH were manual labour (44.3%) followed by agriculture (39.3%). Business ranked third, while miscellaneous occupations such as service, skilled and semi-skilled workers constituted another seven percent. Labour earnings thus were the single largest source of income for the KA HH while there were overlapping of labour in own land and wage earning to supplement income in many instances. This is consistent with early studies, which have shown that KA HHs often depend on insufficient agricultural land, a homestead in a small parcel of land, and labour earnings for livelihood[2,15]. Animal husbandry is an essential part of this agrarian lifestyle, with dependence on cattle for manure, dung cakes for cooking fuel use of animal power in ploughing and transportation and live animal or animal products for consumption and sale.

The per capita income (PCI) for Nepal in the year 2003 was US dollar 276 (see endnote J). The mean HH income among the KA HHs was Rs. 40547 (s.d. 28594) while the mean PCI was Rs. 6302 (s.d. 5516, equivalent to US $ 85.2). This figure was much lower than the mean PCI for the two districts (Siraha: Rs. 11900 and Saptari: Rs. 12703 at 2001 price; UNDP, 2004). Based on the PCI criteria adopted by HMG/N, 67.21 percent of the KA HH were poor (see endnote K).

Household income (HHI) quintiles were used as a proxy for socio-economic indicators as most of the families did not possess productive assets that could serve as indicators for construction of socio-economic index. The HHI for KA HH revealed stark inequality among KA HHs. For instance, the lowest 20 percent income group (quintile) survives only on 9 percent of the total income of all KA households, while the highest 20 percent has 41 percent share (Table No.4). 44 percent of income from agriculture goes to the highest quintile while the lowest quintile obtains only 8 percent. The lowest quintile has no income from salary (regularly paid on a monthly basis), while they obtain 8 percent and 11 percent of the total income from agriculture and wage earning (paid on daily basis on employed days only) respectively among the sampled KA HH. A statistically significant negative correlation (-0.361 at 0.01 level) was observed between HH size and PCI.

Among the various sources of information on KA, radio was the most common (59.6%). Other sources were neighbors (17.1%), health workers (12.3%), prior KA history in the family member (5.3%), TV (3.5%) and posters (1.8%). Among the various sources of media information on KA, the poorest HHI quintile accessed information, if any, on KA from posters most often, followed by radio; this income group has low access to TV and counseling by health workers. In our study, these HH did not receive any information on KA from health workers, the service of whom was found to be enjoyed by the highest quintile alone. The highest income quintile was also found to have the greatest access to information provided through TV. The poorest income quintile was the group most likely to

seek treatment in the informal sector (see endnote L), which may be a result of their having the least access to information, because actual KA treatment is available only in the formal health system (see endnote M). The resources and time spent for treatment in the informal sector only adds to the cost of KA treatment and work days lost.

It was also observed that the HHs with higher HHIs started treatment-seeking within a week of the onset of illness. However, the total cost of treatment was higher for patients starting treatment earlier. This was mainly due to high food costs incurred in public hospitals, an expenditure component granted by their ability to pay (high HHI). Respondents indicated various factors responsible for the decision to approach the informal sector first, rather than approaching the formal sector directly. The lowest income quintile considered long travel distance to a public hospital as the major barrier, while the second lowest quintile reported "awe" or "fear" to visit public hospitals as the major reason (Table 3). The high cost that would be incurred and long distance were considered the major barriers to seeking care in the formal sector by the highest and second highest income groups, while belief in the informal sector was the most powerful reason deterring the median income group from approaching the formal health system.

Table 3 Distribution of most important reasons for not visiting public hospitals perceived by various HHI quintiles

S.No.	*Reasons for not going to Public Hospital**	*HHI Quintiles (in percentage)*				
		I	*II*	*III*	*IV*	*V*
1.	Long travel distance	33	0	17	17	33
2.	High cost of treatment	13	13	26	30	17
3.	Faith in treatment in informal sector	28	8	32	20	12
4.	Awe or fear to visit formal sector	25	50	0	25	0

*A HH could also have more than one reason for not going to the public hospital.

The average direct cost of treatment (see endnote N) of the patients estimated for one episode of KA was Rs. 7076.23, which consisted of the cost of treatment in the informal (12.7%), private (39.5%) and public sectors (47.8%). The equity implication for access to treatment among various income quintiles revealed (in Table No. 4 below) that this payment was biased against the poor, as poorest 20 percent of HH had to pay 29 percent of the total costs paid by all quintiles.

Table 4 Distribution of economic attributes among various income Quintile of KA HH

	Household Income Quintiles				
Attributes of KA HH	**Quintile I**	**Quintile II**	**Quintile III**	**Quintile IV**	**Quintile V**
Per capita income share	9	11	19	20	41
Total loan borrowed	27	16	30	14	14
Total cost in informal sector	18	16	24	29	12
Total cost in private sector	41	18	16	7	18
Total cost in public hospital	21	14	17	19	29
Grand total cost (informal+private+public)	29	16	17	16	22

Because of the existing relationship between socio-economic structures and access to health care, it was found that the poverty incidence after an episode of KA rose to 89 percent from the pre-KA level of 67 percent[16]. Analysis of the cost of treatment in the public sector revealed that the medical cost constituted the largest share of expenditure (66.5%), followed by food cost (22.6%), travel cost (8.9%) and other costs (1.9%). It was observed that most of this cost was regressive in structure. Furthermore, we found that 80.3 percent of the HH had borrowed loans in course of KA treatment or recovery. The lowest quintile borrowed 27 percent of the total loan amount borrowed. The highest borrower, however, was the third quintile, perhaps due to its creditworthiness. Institutional financing to cope with KA incidence was found to be lacking in the SSD.

Low levels of income and high costs of medical treatment compel people to avert or delay medical treatment against KA as long as possible, and treatment

is often sought only after the condition of the patient is critical[17]. In our study, 83 percent of the highest income group sought treatment for KA within a week of the onset of symptoms, while only 17 percent of the poorest HH started treatment seeking within a week. Among the poor HH, the reason that prompted the poorest to seek treatment early was mainly to avert the catastrophic impact that would befall the family when the only individuals earning income were away from work.

Analysis focusing on Dalits: This analysis of the KA HH based on Dalit and non-Dalit status and their socio-economic attributes in relation to KA treatment could also provide important insight.

The ethnic community of people recognized as Terai Dalits constituted 5.6 percent of the total households in Nepal and 44 percent of them were landless. The adult literacy percentage among the Terai Dalits (21.6 percent) was significantly lower than the national average of 54 percent[10]. As indicated above, the literacy among the Dalits in the study area was 3 percent lower than the national average for the Terai Dalits.

The PCI of the non-Dalits was 1.42 times higher than the Dalit. 74 percent of the Dalit KA HH and 54 percent of the non-Dalit HH were absolutely poor. The Dalits were more concentrated in rural compared to urban areas. The cost of treatment borne by the non-Dalits was higher than the Dalits by 31 percent implying that the non-Dalits spent relatively more in treatment compared to Dalits. In contrast, regarding the opportunity cost of the work days lost, the Dalits lost 25 percent more compared to non-Dalits. The average aggregate cost (the cost of treatment and the opportunity cost of work days lost combined) to the Dalits KA HH as a result of one episode of KA incidence was higher by 3 percent compared to the non-Dalit counterpart. However, this difference came out to be very large in relation to the annual HH incomes of the Dalits. For instance the total cost of one episode of KA costs 37.6 percent of the annual HH income of the non-Dalits while it costs 56.8 percent to the Dalits. The Dalits, with already low average annual income, suffered a loss of more than half their annual HH income as a result of a episode of KA (Table 5).

Table 5 Socio-economic attributes of KA HH by Dalits and non-Dalits category

S.No.	Socio-economic attributes	Non-Dalits	Dalits
1.	Annual HH income (in Rs.)	47150.9	32230.0
2.	Per capita income (in Rs.)	7085.0	4989.3
3.	Average educational attainment (grade)	3.44	0.74
4.	Absolutely poor HH (percentage)	54.0	74.0
5.	Rural residence (percentage)	54	46
6.	Urban residence	66.7	33.3
7.	Total cost of treatment (in Rs.)	7894.3	6046.1
8.	Average workdays lost per episode of KA	143.1	186.5
9.	Opportunity Cost of workdays lost (in Rs.)	9841.4	12255.6
10.	Cost of KA of one episode as a percentage of HH annual income	37.6	56.8

Discussion

The study reaffirms that KA most strongly affects the poor and pushes them further into deeper poverty[15]. KA maintains its status as a neglected, if not "most neglected" disease in the public health regime with incidence falling on the most weaker section of the community such as the Dalits, untouchables and the marginalized groups who do not possess powerful pressure groups to advocate their needs. Lack of affordable new drugs, still a basic unsolved problem, has also been joined by additional therapeutic obstacles including large-scale resistance to first line drug and co-infection with human immuno-deficiency virus, tuberculosis etc[18]. A large proportion of the population living in the KA endemic areas of Nepal are vulnerable to KA, largely due to socio-economic, behavioural, cultural, environmental and governance factors that prevent them from taking measures to protect themselves from the disease such as: living in houses and environment free from KA vector sand flies, raising livestock in separate dwelling at a safe distance, obtaining adequate protection through good quality and timely insecticide sprays, securing adequate financial protection to ensure treatment seeking at the onset of the disease so that the KA infected patient does not serve as a "human reservoir" for KA transmission, health seeking in the formal sector rather than quacks, traditional healers etc[7]. Several socio-economic indicators of the SSD such as low PCI, adult literacy particularly female literacy, access to sanitation etc. being inferior to the national scenario also substantiates

this reality. Due to topographical, environmental and socio-economic characteristics, other KA endemic districts in the Terai region also resemble SSD in many of these attributes.

Due to these factors, the geographical coverage of KA has been increasing every year since its first case appeared in 1980. As KA is a disease with man as the only reservoir host[19], and the disease is transmitted only through infected sandfly bites, KA transmission can be avoided only through the prevention of circumstances that lead to sandfly-human contact. This host of factors—socio-economic, behavioural, cultural, governance etc—can be addressed only through attainment of a broad based development that encompasses improvement in all aspects of life including life sustenance, freedom from ignorance, disease, squalor and the self esteem to lead a dignified life.[20] However, this is possible only in the long run. In the short run, there is a need for policies, programmes and activities to improve the level of income through integrated poverty alleviation, which includes access to productive resources (through land redistribution, productive loans etc., for instance) and creating employment opportunities for the low income communities. This can bring about improvement in housing conditions, alternative sources of livelihood and better management of domestic animals, which in turn may reduce the incidence of KA drastically, as learnt from experiences of countries that have experienced socio-economic transition. It may also enable individuals in poverty to seek treatment earlier, which, in addition to improving treatment outcomes and reducing indirect costs from lost work time, can shorten the length of time in which the individual is capable of serving as a reservoir for the disease. This should be supplemented by media campaigns to improve KA-related functional literacy at the community level and active case detection of KA cases through community outreach activities. The Dalits, who are already lagging in terms of all socio-economic indicators, are likely to be disproportionately affected by KA (both in terms of incidence and economic impact), resulting in widening gap between the Dalits and non-Dalits. Positive (preferential) discrimination in treatment of KA such as free provision of drugs and other expenses at public hospitals could help to reduce economic burden among Dalit KA HH.

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End Notes

A. KA is a disease caused by the bite of sandfly (*Phlebotomus argentipes)*, a vector that feeds primarily on domestic cattle but sometimes shows a deviant behaviour of feeding on human blood. People who keep cattle and share common space together are more likely to be infected by KA.

B. An earlier study indicated that the KA HH spent 16 percent of their HH income on KA treatment and lost 178 workdays[3], which was equivalent to 20 percent of their HH income, suggesting that the direct and indirect cost combined constituted 36 percent of the HH income. Adhikari et al. found an even more alarming picture, with the direct and indirect cost constituting about 62 percent (17.5 and 44.4 percent respectively) of the HH income of the KA HH[22].

C. A HH was defined as persons living together and sharing the same kitchen for the last six months.

D. At that time, there was an incidence of 1.5 per 100,000 and a case fatality rate (CFR) of 5.88 percent.

E. It is to be noted that these figures may hide the magnitude of the problem, as they reflect grossly underestimated hospital records that do not cover cases of morbidity or mortality of patients who had no access to hospital treatments; this makes estimation of actual prevalence difficult[1].

F. In the mentioned research project: NM Maskay; SR Adhikari; BP Sharma; AB Joshi; P Wijeyaratne; and SD Joshi were respectively Principal Investigator; member (health economist); member (social scientist); collaborator; collaborator; and research assistant respectively.

G. Among the vector borne diseases, Saptari recorded a total of 1200 cases of KA, the highest number of KA among the 13 KA districts in Nepal followed by 892 cases in Siraha, the second highest in Nepal during the

three consecutive years (2000-2002). The average case fatality rates (CFR) for Siraha and Saptari districts were1.36 (2000-2002.) and 1.0 (2000-2001 A.D.) percent respectively.

H. Gini coefficient (GC), a measure of inequality (generally income) in land holding gives an area between the Lorenz curve and the line of absolute equality. The value of GC varies from zero (absolute equality) to unity (absolute inequality).

I. Dalits are those who, by virtue of caste-based discrimination and untouchability, are generally marginalized in social, economic, educational, political and religious spheres and are deprived of human dignity and social justice[10].

J. 1 US $ =Nepalese Rs. 74[21].

K. People with a per-capita income below Rs. 4404 at 1996 price are considered absolutely poor.

L. Informal sector health service providers consists of traditional faith healers, drug vendors, and local drugs stores that sell drugs without prescriptions from authorized medical practitioners.

M. The first line and second line drugs for KA treatment are provided only through public hospitals. Facilities for KA diagnosis are available both in the public hospitals and private clinics in KA districts. Patients seeking treatment in private hospitals and clinics are referred to public hospitals once they are diagnosed with KA.

N. The direct cost comprised of medical and transportation cost, food and other related expenses incurred by the KA HH from the inception of the symptom to recovery from KA.

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