

Child Development Research

Original Research Paper

Audit of Child Mortality in Mali: Case Study of Finkolo Ac/Sikasso and Massantola-Sabougou/Kolokani Rural Areas

Daou P¹, Diakite C¹, Willcox M^{2, 3}, Traore A⁴, Bamba D¹, Sidibe K¹, Berthe D⁵, Traore S.O⁶, Coulibaly E⁷, Diarra D⁷, Dembele M.E⁸, Sangare A⁹, Guindo I¹⁰, Diallo D¹, Traore M⁶

¹Department of Traditional Medicine / National Institute for Public Health Research, Bamako, Mali

²Nuffield Department of Primary Care Health Sciences, Oxford University, England

³Department of Primary Care and Population Sciences, University of Southampton, UK

⁴University of Ségou, Mali

⁵Sociologist, Sikasso, Mali

⁶Health Referral Centre, Municipality 5, Bamako, Mali

⁷Health Referral Centre, Kolokani, Mali

⁸Paediatrician, Sikasso Hospital, Mali

⁹Paediatrician (retired) Sikasso, Mali

¹⁰Chief Medical Officer, Health Referral Centre, Sikasso, Mali

*Corresponding author(s): Dr Pierre DAOU, Department of Traditional Medicine / National Institute for Public Health Research, Bamako, Mali

Email: pierredaou@yahoo.fr, piedaou@gmail.com

Tel: (223) 65 05 66 73, (223) 76 45 08 07

Accepted: 2017.03.20; Published: 2017.05.02;

ABSTRACT

Aim: Contribute to a reduction in child mortality (children less than 5 years of age). **Materials and methods:** The investigators were informed by community representatives who subsequently conducted interviews. They frequently consulted Traditional Health Practitioners and went to Community Health Centres if a patient had been treated there. A report was submitted to a technical committee each month. **Results:** During the 12 months of the study, 152 cases at Finkolo AC and 68 in Massantola-Sabougou were identified. Mortality peaked in September with 35% in the Massantola-Sabougou area and with 16% in the Finkolo AC area. Malaria was the leading cause of death with Finkolo AC at 41% and Massantola-Sabougou at 67%. About 69% of fathers and 76% of mothers at Finkolo AC and 71% of fathers and 85% of mothers in the Massantola-Sabougou areas were illiterate. Mothers were most commonly aged between 20 and 30. **Conclusion:** The audit highlighted certain shortcomings. However, increasing community awareness and developing and validating traditional medicine resources could help reduce the rate of child mortality.

Keywords: Audit; child mortality; self-medication; Health Center

INTRODUCTION

Access for all to a qualified, motivated and supported health care worker is a fundamental right and one of the steps toward reducing child mortality. Goal 4 of the Millennium Development Goals (MDGs), which relates to reducing child mortality (children less than 5 years of age), is a leading public health priority throughout the world. According to a 2011 World Health Organization (WHO) report¹, the child mortality rate fell from 12.4 million in 1990 to 8.1 million in 2009; and from 89 deaths per 1,000 live births to 60 deaths per 1,000 live births in developing countries. In many of these countries, it can be difficult to obtain detailed information about such deaths and the causes of mortality. In order to ameliorate this situation, a method of verbal autopsy (VA) has been implemented. This involves asking household members about the circumstances of a death in the family, in order to determine the causes². An updated method implemented by Biraud in 1954³ registered the symptoms noted by non-medical personnel prior to death. This idea was improved upon by the WHO in 2009⁴. As in most

African countries, Mali has a high child and adolescent death rate with many of these cases not registered. However, from 1988 to 1998, the rate fell from 251 to 229 deaths per 1,000 live births⁵, to 233 per 1,000 live births in 2006, then to 191 per 1,000 live births in 2006⁷. In order to contribute to a reduction in these deaths, an audit (pilot study) or verbal autopsy (VA) method was implemented. A record of children's deaths obtained from confidential surveys was conducted in two areas of Mali: the rural town of Finkolo AC which is located in the Sikasso region and Massantola and Sabougou health areas located near the rural town of Massantola in the Kolokani area (Koulikoro region). This study, a first in Mali, was a collaboration over a four year period between five universities; four of which are in Africa (Mali, Uganda, South Africa and Sudan) and one in the United Kingdom, Oxford University (England). This paper presents the results of the first year of the audit in the two localities mentioned above.

METHODOLOGY

It is a descriptive study, which took place from September 1, 2011, to August 31, 2012, and which is centered on the health areas of Massantola and Sabougou (near the rural town of Massantola in the Kolokani area) and in the rural town of Finkolo AC (Sikasso region). It was a comprehensive sampling of all recorded cases of deaths of children under 5 years of age during that time period.

Conduct of the investigation

Information on deaths was relayed to investigators by a community representative or by a health care worker. These investigators subsequently went to the family of the deceased to extend their condolences. A week or two later, they went to that family again to conduct the investigation. They often went together with a traditional health practitioner (TPS), with a traditional midwife, or with health centre personnel if care had been sought there (as per the therapeutic route of the deceased).

Conduct of the Audit and Technical Committee Meetings

Each month, a Technical Committee comprised of paediatricians, gynaecologists, general practitioners, the core district health care team, traditional medicine experts, traditional health practitioner and traditional midwife representatives and health technicians from various health care centres, met to discuss the causes of death. During these working sessions, the investigator laid out the facts in each case of death to inform the Committee. The Committee debated the likely cause of death and discussed avoidable factors. These recommendations were then submitted from a local level to a larger committee and to other national health care authorities. This larger committee met on a six monthly basis to discuss and implement the recommendations.

Ethical Considerations

The study was submitted to the National Institute of Public Health Research (INRSP) ethics committee, which gave its approval to conduct the study.

Participation in the study was voluntary for families, health care workers, and traditional health practitioners. All participants had to signify their agreement with a signature or with a fingerprint on an informed consent form.

RESULTS

A total of 220 cases of death were identified in the two localities; 68 deaths in the Massantola and Sabougou areas and 152 deaths in the Finkolo AC municipality. In both locations, the largest numbers of deaths were recorded during the months of July, August, September and October with more than 69% in the Massantola-Sabougou area and approximately 48% in the rural town of Finkolo AC. The peak was recorded in September with 35% in Massantola-Sabougou and 16% in Finkolo AC respectively (Figure 1).

Deaths occurring at home dominated with more than 69% of cases in the two localities. Whereas in health care centres such as Community Health Care Centres (CSCOM), rural maternity centres and Health Referral Centres. (CS ReF), 23% of deaths occurred at Finkolo AC and 18% of deaths occurred at Massantola-Sabougou. Malaria was the leading cause of child / adolescent deaths. Deaths attributed to malaria comprised 41% at Finkolo AC and 67% at Massantola-Sabougou (Table I). In children aged between 1 month and five years, malaria was responsible for 55% of deaths at Finkolo AC and 80% of deaths at Massantola-Sabougou. Severe acute malnutrition was the second cause of mortality. It represented 18% and 12% respectively at Finkolo AC and Massantola-Sabougou. Kwashiorkor was the most frequent form of malnutrition at more than 86% in the two localities.

Neonatal deaths (infants 0-28 days) were 19% at Massantola-Sabougou and 23% at Finkolo. Most of these deaths (60%) occurred during the first week of life at the two localities. Home births were more common at Finkolo AC (57%) with Massantola-Sabougou at 17%. Neonatal infection, neonatal hypoxia/asphyxiation, and prematurity were the main causes of neonatal deaths with a predominance of neonatal infections in more than 42% of neonatal deaths and 11% of child/adolescent deaths. In newborns, neonatal infections were followed by prematurity and neonatal hypoxia/asphyxiation with 27% at Finkolo AC and 33% at Massantola-Sabougou (Table

l). Prematurity at Finkolo AC and neonatal hypoxia/asphyxiation at Massantola-Sabougou, were respectively 7% and 6% of all the cases of child adolescent deaths. According to sibling rankings, third born child deaths were more frequent at 24% of cases followed by 19% of cases in/first born children at Massantola-Sabougou. At Finkolo AC, the deaths of the firstborn two children were the most frequent with 25% for the first child and 15% for the second (Table 2). The socio-demographic profile of the parents showed a low literacy rate.

At Massantola-Sabougou close to 71% of fathers and 85% of mothers were illiterate; 21% of fathers and 10% of mothers had a primary school level of education. These results were almost similar in the Finkolo AC area where 69% of fathers and 76% of mothers were illiterate. In this latter area, 13% of fathers had a primary school level of education, and 3% had a high school education. Amongst mothers, school enrollment at the secondary level at 6% was slightly higher than that of the fathers. In households, only 10% of both parents (father and mother) had a primary level of education and 5% a secondary level of education at Finkolo AC whilst neither fathers nor mothers at Massantola-Sabougou had both levels of education. Mothers in the 20-30 years age group were the most prevalent with 46% and 54% respectively at Finkolo AC and at Massantola-Sabougou with mothers over 30 years of age at 28% at both sites.

Knowledge and attitudes of parents facing the illness of the child are important factors in child survival. Thus, in the two communities, a lack of awareness of the disease was frequently encountered. At Finkolo AC 79% of parents did not know the cause of death of their child against 21% who had some idea. In total, 73% of parents had sought care from a modern health care worker, amongst which, 67% had little idea about the disease with only 5% of parents consulting a traditional health care practitioner.

In the Massantola-Sabougou area, the conclusion was much the same. Again, 60% of parents did not know the cause of death of their child. Among the 69% of parents who sought care at a health centre, 29% did not have any knowledge of disease processes. In both of these communities, there was a total lack of knowledge of acute malnutrition. In fact, the ignorance of disease processes by the parents did not have a big impact on seeking care, but rather, on the delay in seeking care. At Finkolo AC only 25% of parents sought an immediate medical consultation with the onset of signs and symptoms, whilst 36% sought care between one to three days, and 17% took more than fourteen days before seeking health care.

Between ignorance of the disease and the delay in seeking care, it is apparent that only 27 percent of parents sought medical consultation at the onset of illness and 73% waited at least one day before seeking care, with 41% seeking care between the first and third days and 21% seeking care between four to seven days. At Massantola-Sabougou an immediate search for health care was weak in comparison to Finkolo AC. This was 11% compared with 42% for one to three days, and, 21% for more than fourteen days. The delay may be due to certain cultural values and standards that underpin traditional society. In the rural town of Finkolo in 59% of cases the birth parents (father and mother) were involved in seeking care at a health centre; the grandparents (grandfather and grandmother) at 27% and 14% for other people such as aunts and uncles, health care workers and neighbours.

A similar scenario was seen at Massantola-Sabougou where 58% of biological parents, 26% of grandparents and others, such as aunts and uncles were involved in the quest for care (Figure 2).

The search for health care was preceded in the majority of cases with self-medication. This was at 62% at Finkolo AC and this increased slightly at Massantola-Sabougou to 66%. The use of a traditional health practitioner was less common at Finkolo AC at 5% compared to Massantola-Sabougou at 66%. In both communities, the health care centres were similar with Finkolo AC at 71% and 73% for Massantola-Sabougou. In the Finkolo AC area, the therapeutic attitude most evident was self-medication prior to seeking care at a health centre

(34%). Self-medication without seeking other care was practiced by 30% of parents and consultation at a health centre without prior self-medication by 26% of parents. In other situations, the parents started care at a health centre before relying on self-medication (5%) or a traditional health practitioner in rare cases. At Massantola-Sabougou, consultation with a traditional health practitioner was more frequent than at Finkolo AC in 57% of cases.

DISCUSSION

The verbal autopsy or audit is a method which enables classification of the cause(s) of deaths, especially in rural communities. However, this method has a few shortcomings called bias or system errors. The bias or system errors are defined as an error in the estimation of a phenomenon, leading to a difference between the value of a parameter in a sample and its true value².

The most important biases were:

- The age of the deceased;
- The classification of mortality;

The questionnaire.

The investigators;

The delay between the date of death and the date of the investigation⁸. The methodology used in this study helped to minimize systematic errors in accordance with the recommendations of the WHO (2009) verbal autopsy standards⁴.

The questionnaire was divided into two types according to age:

- A questionnaire for those aged 1 month to 59 months;
- A questionnaire for neonates aged 0 to 28 days.

These two questionnaires, as listed with question filters, were led by a final year medical student who was accompanied by a local sociologist. The delay between the date of death and the date of the interview was, on average, two weeks as recommended by Kroeger (1983)⁹. This short delay permitted a maximum amount of information to be gathered from respondents. The respondents, in the majority of cases, were the biological parents or the person who took care of the child during the illness. The search for the cause of death was often a sensitive issue for the technical audit committee. This was due to the lack of information such as:

- A lack of certain information at parental level (prescriptions orders thrown away after the death of the child; a lack of knowledge of the exact age of the child; a lack of knowledge of the date of the onset of the illness);
- The absence of regular registration of patients in health centres;

- The lack of registration of anthropometric parameters and non-implementation of certain biological tests hameoglobin (THb) and rapid diagnostic tests (TDR).

Faced with these situations, the committee relied on the symptoms described by parents, health workers or the traditional health practitioner in order to reach a diagnosis. Despite the long history of verbal autopsy, this study was, in fact, a first in Mali.

The methods relating to confidential inquiry encountered some difficulties on the ground and these issues essentially were:

- Late submission of information to investigators by community representatives.
- The refusal of some health care workers and traditional health practitioners to collaborate for fear of being held liable;
- Geographical inaccessibility; inaccessibility during the wet season due to flooding / poor road conditions; or inaccessibility during times of traditional ritual(s).

However, the study could be carried out and the various difficulties were resolved over time. The death of a mother during pregnancy or childbirth is a human tragedy both at an individual and family level but also at a social level¹⁰. If this is thought true for mothers, it may not be seen as of such importance during a child's development in developing countries, especially in rural communities. Some remarks overheard during our investigations included: "as long as the water jar has not been broken, it can always be used to conserve water". This denotes the insignificance and indifference to death in some rural societies regarding infant and child deaths. Additionally, those deaths occurring at home were due in most cases to delays in seeking treatment

The most common of these delays in the first instance emanated from the family decision to seek care. Several factors were involved in this delay. These were essentially a lack of knowledge of the illness or of negligence, self-medication or the social structure of the family. This last factor was very important with regard to decision-making processes when seeking care. In Malian society, especially in rural areas, the ability of women to be able to make decisions is rare. These decisions come back mostly to the husband's parents or the de facto partner himself. In our study, we found that after the father, that most of the decisions were made by grandfathers, grandmothers, grandparents together or uncles. In the two localities, the decision by mothers alone to seek care was low. This observation confirmed the assumption of Some et al. in Burkina Faso¹¹. In addition to these factors, there were also the daily tasks required of mothers such as working in the fields or a lack of financial resources.

The attitudes of health care staff were also a handicap, especially relating to timely decision-making and the researching of appropriate health care interventions and options. Barry (2008)¹² found that some health care personnel behaviour with respect to patients or carers could also be a constraining factor for attendance at healthcare facilities. Moreover, the ability of health care workers to implement a therapeutic decision was the third cause of the delay.

The age of the mothers and the educational level of the parents also played a role in the survival of the child. With regard to schooling, our study showed that the chances of child survival increased with the level of education attained. According to LIBITE¹³ the death of a child, whose mother has had any level of schooling, is 1.34 times that of a mother with no schooling. Those mothers with secondary level schooling

ranked higher than those with primary level schooling at 39% against 29% respectively. In the postnatal period, this increases even more to 1.85 times. The research of Upadhyay et al¹⁴ in India found a similar result. According to INSAT¹⁵ data, the schooling rate in the Sikasso region was significantly lower than that in the Koulikoro region. Indeed, a low level of education can be an obstacle for accessing and understanding public health messages about good health practices.

The age of the mother was also a determining influence on the death of a child. At the two (2) sites of our study, the 20-30 age group was the most common. This corresponds to the period of reproductive activity. These results confirm those of Diakité (2004)¹⁶ in the third municipality of Bamako, which found 36.7% of reproductive activity in the 20-35 year age bracket. On the other hand, LIBITE¹³ in Cameroon showed a high incidence among mothers less than 20 years of age. Among mothers under 20, deaths were much more frequent, especially for the first born child. In the Massantola-Sabougou area, 13% of deaths were amongst mothers aged less than 20 years, with 90% of them having lost a first born child. In the rural town of Finkolo AC 82% of mothers aged less than 20 years had lost their first-born child.

Takou¹⁷ in Yaounde also found that the loss of the first born child posed a greater risk of mortality compared to other ranks. This hypothesis corroborated the results in Sikasso where 25% of the cases were of the first born rank. However, Massantola was at the third rank (Table 2). Shaman and al¹⁸, in Iran instead, found that the probability of death was higher in the 3rd rank. This hypothesis was confirmed among women aged 20-30 years at Massantola-Sabougou. However, at Finkolo, among women aged 20-30 years the first two ranks were at an increased risk of death. This could be explained by the immaturity and lack of childcare experience of these young mothers. In addition to these factors, the parity of the mother and reproductive pacing played an important role in the mortality of children.

CONCLUSION

The mortality of children under 5 years of age is a public health issue worldwide with the majority of cases occurring in Africa. Mali is one of the many African countries paying the heavy price of these deaths. The main causes were malaria and malnutrition among the 1 month to five-year-olds with neonatal infections and prematurity for those at 0-28 days. The level of education of parents and the age of the mothers are significant factors that influence child survival. In addition to these factors, the lack of skilled health care resources plays an essential role in child mortality. The development of traditional medicine and raising community awareness are essential factors in helping to reduce the child mortality rate.

Tables and Figures

Table I: Frequency and distribution of causes of mortality in children less than 5 years of age

Cause(s) of death	<i>Massantola-</i>	<i>Finkolo AC</i>
	<i>Sabougou</i>	Frequency
	Frequency (%)	(%)
<i>Severe Malaria</i>	67	41
<i>Severe Malnutrition</i>	10	17
<i>Neonatal Infection</i>	10	11
<i>Bacterial Infections</i>	1	0
<i>Domestic Accidents</i>	1	0
<i>Diarrhoea</i>	0	4
<i>Septicaemia</i>	0	2
<i>Meningitis</i>	0	3
<i>Pneumopathy</i>	0	7
<i>Congenital</i>	0	1
<i>Malformation</i>		
<i>Unexpected Death</i>	0	1
<i>Prematurity</i>	5	7
<i>Anoxia/foetal hypoxia</i>	6	5
<i>Neonatal tetanus</i>	0	1

Table 2 : Distribution of maternal age and sibling ranking

	Massantola- Sabougou				Finkolo AC			
	<20	20-30	31-40	>40	<20	20-30	31-40	>40
Sibling Ranking								
<i>Level 1</i>	9	4	0	0	23	15	0	0
<i>Level 2</i>	1	5	0	0	3	17	3	0
<i>Level 3</i>	0	15	1	0	2	13	0	0
<i>Level 4</i>	0	3	1	0	0	13	2	0
<i>Level 5</i>	0	6	3	0	0	6	4	0
<i>Level 6</i>	0	2	4	0	0	12	8	0
<i>Level 7</i>	0	2	5	0	0	5	10	0
<i>Level 8</i>	0	0	4	1	0		5	1
<i>Level 9</i>	0	0	1	2	0	1	1	2
<i>Level 10</i>	0	0	0	0	0	0	3	0
<i>Level 11</i>	0	0	1	0	0	0	1	0
<i>Level 12</i>	0	1	0	0	0	0	1	1
TOTAL	10	38	19	1	28	82	38	4

REFERENCES

1- OMS. "Statistiques sanitaires mondiales 2011." 2011, 1-170
 2-SYLLA, S. N. (2009-2010). Biais de mémoire au cours des autopsies verbales dans le DSS de Niakhar de 2000 à 2008 Institut de Recherche pour le Développement Niakhar, UFR Science Appliquée et Technologie. Master: 1-102.
 3- Biraud Y. (1956). Méthodes pour l'enregistrement par des non médecins des causes élémentaires de décès dans les zones sous-développées. OMS HS/60. Genève.
 4- OMS. Normes d'autopsie verbale: Etablissement et attribution de la cause de décès." OMS, Genève, 2009, 1-132.
 5- EDS III-Mali
 6- UNICEF, Mortalité infantile et juvénile, 2000, 2-3
 7- EDS IV-Mali.

8- Garenne M,Fontaine O. Enquêtes sur les causes probables de décès en milieu rural sénégalais.1988, 123-141
 9- KROEGER, A. "Illness perception and use of health services in north-east Argentina." Health Policy and Planning 3(2): 1983, 141-151.
 10- MALLE, C. K. L'audit des décès maternels au Centre de Santé de Référence de la Commune V du District de Bamako A PROPOS DE 42 CAS service de Gynécologie-Obstétrique Bamako, Faculté de Médecine, de Pharmacie et d'Odonto – Stomatologie Doctorat, 2007-2008,1-115.14 Audit – Child Mortality – Draft 1.1 _March 2017
 11-Somé DT, Sombié I, Meda N. How decision for seeking maternal care is made - a qualitative study in two rural medical districts of Burkina Faso. Reprod Health 2013; 10 (8): 1-6.

- 12- BARRY, B. Mortalité maternelle: cause et facteurs favorisants déterminés par l'autopsie verbale dans le département de Bakel. Institut de Formation et de Recherche en Population, Développement et Santé de la Reproduction (I.P.D.S.R). Bakel, Université cheikh Anta Diop de Daklar. Master, 2008,1-72. <http://www.memoireonline.com/07/11/4592/Mortalite-maternelle-cause-et-facteurs-favorisants-determines-par-lautopsie-verbale-dans-le-d.html> (consulté le 02/12/2016)
- 13- LIBITE, P. R. et col. Enquête Démographique et de Santé Cameroun 2004:Mortalité des enfants. Institut National de la Statistique. Yaoundé, 2005, 211-224.
- 14- Upadhyay RP, et col. Determinants of neonatal mortality in rural Haryana: A retrospective population based study. *Indian Pediatr* 2012; 49 (4): 291-4.
- 15- INSAT. 4ème recensement général de la population et de l'habitat du mali (rgph-2009) /état et structure de la population, Décembre 2011,1-120
- 16- Diakité, A. Les facteurs de mortalité néonatale infantile et juvénile dans la commune III du district de Bamako, Bamako, Faculté de Médecine de Pharmacie et d'Oodonto-Stomatologie Doctorat2005, 1-63.
- 17- TSAPMENE, V. T. Facteurs de risque de la mortalité néonatale à l'Hôpital gynéco- obstétrique et pédiatrique de Yaoundé. Yaoundé, Faculté de médecine et des sciences biomédicales Université de Yaoundé I. Doctorat, 2012,1-90. http://www.memoireonline.com/01/14/8588/m_Facteurs-de-risque-de-la-mortalite-neonatale-l-Hpital-gyneco-obstetrique-et-pediatrique-d.html (consulté le 20/11/2016)
- 18- Chaman R. et col. Neonatal mortality risk factors in a rural part of Iran: a nested case-control study. *Iran J Publ Health* 2009; 38: 48-52.