Child Maltreatment and associated Sociodemographic factors among Children affected by HIV/AIDS in Ghana: A Multi-Informant Perspective

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Research Article

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Abstract

Background: Child maltreatment and its consequences are considered a major public health concern among children because they can cause significant physical and psychological problems. Child maltreatment is widespread but often underestimated. Surprisingly, there is hardly any data on the frequency of child maltreatment in general and particularly on orphans and vulnerable children in low-income countries.

Method: This study employed cross-sectional, quantitative survey that involved 291 children aged 10–17 years in Lower Manya Krobo District, Ghana and examined their exposure to and experience of child maltreatment. The survey also examined parents/caregivers' exposure and perpetuation of child maltreatment.

Results: Some form of maltreatment within the household was reported by approximately 90% of children, and it was significantly higher among orphans and vulnerable children (OVC) as compared with comparison children. Children living with HIV/AIDS-infected parents and orphans of any type reported higher exposure to domestic violence and experienced significantly more neglect, psychological and physical abuse than the comparison children.

Conclusion: The results of this survey demonstrate that maltreatment among children affected by HIV/AIDS are not rare, and that the dysfunction family conditions that they find themselves bear systemic risks for maltreatment. It is important that culturally appropriate and evidence-based interventions are implemented to address the maltreatment.

Background

Child maltreatment exist in almost all cultures. Different categories of maltreatment are identified to include physical abuse, sexual abuse, exposure to domestic violence, psychological abuse and neglect. Domestic violence encompassing children witnessing parental quarrels, fights and abuses. Child maltreatment is identified as a factor that places children at risk for developmental problems [1]. Chen and Gueta [2] and Levey et al. [1] suggested that irrespective of the form of abuse, it is an increased risk for health problems. Recent literature on children in general found that maltreatment is associated with heightened levels of emotional difficulties such as depression, withdrawal, anxiety and dissociation [3] and behavioural problems including delinquency, aggression, antisocial behaviours and conduct problems [4] and the development of high-risk behaviours [4]. Arslan [6] reported higher mental health problems for children who suffer abuse and maltreatment from their parents. González et al. [7] also observed that exposure to domestic violence is a risk factor in childhood psychopathology. Exposure to domestic violence was consistently found to predict internalizing problems in children including post-traumatic stress symptoms [8].

Jackson et al. [9] found that child maltreatment interferes with normal development of children, and increases risks of children developing a wide range of mental health difficulties [10]. Increased levels of

behavioural problems are mostly reported for children who experienced physical abuse [11] whilst emotional difficulties are mostly identified among children who suffer psychological abuse or neglect [12]. However, Yoon et al. [13] indicated that externalizing problems are consistently identified among maltreated boys whilst abused girls largely present internalizing difficulties. Beside parental personality types, attitudes, perceptions, practices and values, parental illness and death might also create risks for children to be abused and exploited [14]. Cyr and Alink [15] identified poor and negative family environment factors including impaired parent-child relationships and lack of or reduced parental guidance and monitoring as risk factors for child maltreatment. Others include neglectful parenting [16], family instability [17], poverty [18, 19, 20], and poor social support network and isolation [21]. Consistently, it has been demonstrated that orphans and other vulnerable children (OVC) lack adequate care and protection, and frequently live-in households characterized by these negative family environment factors [22]. Yet, to the best of my knowledge and the available literature, no study has examined these observations among Ghanaian orphans and vulnerable children.

Other investigators observed that parents and close family members who are entrusted with providing protection, love and care are the very people that consistently abuse and neglect children [23, 24, 25]. The evidence, thus, suggests that children affected by HIV/AIDS parental illness and death might be at heightened risk for abuse and its subsequent negative consequences. In most African countries, physical punishment of children using sticks and belts is virtually a community norm [17, 26]. There have been suggestions that domestic violence [27] and child abuse [19, 28] in HIV/AIDS affected households could be high. Hence, a better understanding of the levels and forms/sources of child maltreatment among AIDS-orphaned and vulnerable children, can help facilitate strategies to support these children. However, no studies to our knowledge have assessed levels and different types of child maltreatment among children affected by HIV/AIDS as compared with other orphaned and non-orphaned children in low HIV/AIDS endemic settings. This article therefore aims to assess levels of child maltreatment among children in low HIV/AIDS endemic communities of Ghana, and compare whether AIDS-orphaned children experience different levels and types as compared with other-orphaned and non-orphaned children. The current study is the first elsewhere to focus on reports from multiple informants (children and their caregivers). This strategy increases the validity and reliability of variables of interest and also captures important information about contextual effects that may have implications for interventions [29]. Because child and caregiver reports could account for unique variances in predicting relevant child outcomes [30], the findings in this paper reflect more accurate child maltreatment across settings that could be generalized.

Method

Data Collection

A community based cross-sectional survey design utilizing questionnaires was conducted in the Lower Manya Krobo District of Ghana. There was a pilot preceding the present study to validate (examine the appropriateness and comprehensibility of) the study instruments in the research setting. The results of

the pilot study indicated appropriate understanding among the Ghanaian children. The study utilized total sampling technique whereby every household in selected communities who met specified inclusion criteria were approached and asked to participate in the study. This sampling procedure is justified for reasons of feasibility, cost-effectiveness, and accessibility. The total sampling employed also ensured higher participation. Within each community, a limit of 30 was placed on the number of households recruited. This was done to minimize the effects of over-representation from particular communities. Each participating child and their respective caregiver/parent completed the survey questionnaire that followed the steps described by [31]. To handle issues of multiple eligible OVC if at least one child in the house was an AIDS orphaned child, then the child was classified as an AIDS-orphaned child and recruited as such. To identify parental cause of death, a verbal autopsy (VA) was used [32]. The entire assessment inventory took about 30 to 45 minutes to complete. The study protocol was approved by the institutional Research Ethics Review Boards of the University of Glasgow and the Ghana Health Service prior to recruitment of children.

Data Collection Instruments

Items were taken from two previously validated measures (Conflict Tactics Scale and the South African Demographic and Health Survey) to assess child maltreatment. The Conflict Tactics Scale (CTS) was originally developed by Strauss to provide a measure of conflict resolution events that involve violence [33] by obtaining data on possible dyadic combinations of family members. It has since been used in over 70,000 empirical studies and thoroughly evaluated in over 4000 of them [34]. The scale has strong construct validity. The CTS or any adaptation of it was found to have a reliability ranging from 0.77 to 0.95 and internal consistency between 0.67 and 0.86. The present study utilized adapted versions of both parent-to-child and child-to-parent scales. The Child to-Parent Conflict Tactics Scales (P-CCTS) assessed the child's experience of violence (direct and indirect) abuse, neglect, psychological abuse and corporal punishment (physical abuse) within the household. Parents and caregivers' use of punishment and maltreatment in the home as well as domestic violence were captured by the Parent-to-Child: Punishment, Discipline and Violence (ICAST-P). There were also items from the South African Demographic and Health Survey specifically developed for developing countries [35]. These items obtained information on both the child and caregiver's exposure to community violence (both victimization and witnessing). A number of socio-demographic factors such as age, gender, family size, number of other minors living at home, number of changes in residence and age at which children were orphaned (where applicable) were also measured. There were also items regarding children's educational level as well as their present education status (presently at school or not).

Statistical Analyses

The data was analysed using the IBM SPSS (v21). The data were assessed for correspondence with the necessary parametric data analyses assumptions for multivariate analyses of variance, including multivariate normality. Box's Test of Equality of Covariance Matrices indicated that the observed covariance matrices of the dependent variables were equal across groups [Box's M = 38.054, F (30, 151704) = 1.234, p = .176]. Levene's Test of Equality of Error Variances also showed that the error variance of the dependent variable was equal across groups. Differences between the orphanhood

groups on socio-demographic factors were established using chi-square tests or analyses of variance (ANOVAs). Then, relationships between the various socio-demographic factors and child maltreatment scores were examined. These were assessed using independent t-tests and chi square (for categorical variables such as gender, religion and being presently in school) and Pearson bivariate correlations, and ANOVA (for continuous socio-demographic such as age, household size and number of children at home). To handle the multi-informant data, paired-sample statistics and Pearson correlations were used to establish whether reports of young people differed from those of their parents and caregivers. Finally, a General Linear Model involving one-way multivariate analysis of covariance (MANCOVA) was performed to investigated the levels of child maltreatment for the various orphanhood types after controlling for relevant socio-demographic factors (adjusted model).

Results

Participants' Socio-demographic Factors

The participating children in the study had a mean age of 13.03 years (SD = 2.87), with age range 10–17. There were 51% females. There was an average of 4.3 people living in the household. The majority of the children (81.8%) were currently attending school and most of them had had attained primary or junior secondary level education (75%). Approximately, 58% of the parents/caregivers had no more than senior secondary level education. Overall, 62% of all children had moved between 2 or more times (55% of non-orphans, 53% of AIDS-orphans, 85% of other-orphans and 56% of HIV/AIDS-infected parents). In the sampled about 56% of the children (69% of non-orphans, 49% of AIDS-orphans, 45% of other-orphans and 56% of those living with HIV/AIDS-infected parents) indicated that they were Christians, 11% Islam, 20.3% Traditional/African beliefs and 12.7% belonging to other faith. The majority of parents and caregivers (62%) worked mainly in farming, driving, trading or as artisans (carpentry, masonry, bead making). The proportion of households with unemployed parents was higher among children living with HIV/AIDS-infected parents (38%) than the rest of the groups (AIDS-orphans (9.5%), other-orphans (9%) and 7% for non-orphaned children). Eleven percent of parents worked in the formal sector (employment which offer regular wages and hours, which carry with them employment rights, and on which income tax is paid). Descriptive statistics of the participants are summarized in Table 1.

Table 1
Socio-demographic Characteristics of the Participants

	Non-orphaned and vulnerable children (n = 100)				P value
		AIDS-orphaned vulnerable children (n = 74)	Other-orphans (n = 67)	Children with HIV/AIDS infected parent/caregiver (n = 50)	(t-test/chi-square)
Age	11.53 (2.683)	13.78 (2.624)	13.09 (2.673)	14.84 (2.324)	F = 21.131[c]
Gender: Girls	52	50	50.7	48	n. s.
Boys	48	50	49.3	52	
Ethnicity: Dangme/Krobo	63.0%	59.5%	73.1%	56.0%	X = 40.051[c]
Household size	4.98 (0.995)	3.73 (0.969)	4.27 (1.226)	3.96 (1.068)	F = 22.604[c]
No. of changes in residence	1.35 (1.336)	2.76 (1.524)	3.09 (1.685)	1.72 (1.471)	F = 23.844[c]
No. of siblings	1.21 (0.946)	1.95 (0.935)	2.22 (1.277)	2.44 (1.198)	F = 19.807[c]
Location where child lives: urban	50.0%	60.8%	59.7%	58.0%	n. s.
Age child first bereaved		6.27 (4.339)	8.81 (3.456)		
Parental educational level: > Junior Secondary					
Parental unemployment	7.0%	9.5%	9.0%	38.0%	X = 39.695 [c]
Parental Loss: Mother	-	33.8%	34.3%	-	n. s.
Father	-	37.8%	41.8%	-	
Both	-	28.4%	23.9%	-	

[a]Denotes significance at the 0.05 level, [b] denotes significance at the 0.01 level, [c] denotes significance at the .001 level

	Non-orphaned and vulnerable children (n = 100)				P value (t-test/chi-square)
		AIDS-orphaned vulnerable children (n = 74)	Other-orphans (n = 67)	Children with HIV/AIDS infected parent/caregiver (n = 50)	
Religion: Christianity	69.0%	48.7%	44.8%	56.0%	X = 36.271 c
[a]Denotes significance at the 0.05 level, [b] denotes significance at the 0.01 level, [c] denotes significance at the .001 level					

Differences between the groups on Participants Socio-demographic factors

ANOVA shows significant differences [F (287, 3) = 21.131; p < .001] in the age between the four groups. Comparison children were younger than other-orphans (t = 1.560, p < .001), children living with HIV/AIDS-infected parents (t = 3.310, p < .001) and AIDS-orphaned (t = 2.254, p < .001). Similarly, children living with HIV/AIDS-infected parents were older than AIDS-orphaned children (t = 1.056, p < .05) and other-orphans (t = 1.750, p < .001), with no other differences between groups. At the time of bereavement other-orphaned children (Mean = 8.81, SD = 3.456) were significantly older than AIDS-orphaned (Mean = 6.27, SD = 4.339) [t (df = 134) = 2.751; p < .01]. The data also indicated significant differences in levels of household size. Comparison children are living in households larger than children living with HIV/AIDS-infected parents (t = 1.020, p < .001), other-orphans (t = 0.711, p < .001) and AIDS-orphans (t = 1.250, p < .001]. Similarly, other-orphaned children live in households with larger sizes than AIDS-orphaned children (t = 0.539, p < .01) with no other differences between groups. There were also significant differences between the orphanhood groups on residence movements/changes in residence [F (3, 287) = 23.844, p < .001]. Other-orphaned children have moved between homes more than children living with HIV/AIDS-infected parents (t = 1.370, p <. 001) and non-orphaned children (t = 1.740). Similarly, AIDS-orphans have also moved between homes more than children living with HIV/AIDS-infected parents (t = 1.037) and non-orphaned children (t = 1.407), both at p < .001 with no other differences between groups. Other differences on socio-demographic factors are presented in Table 1.

Association between socio-demographic factors and Maltreatment

Interestingly, higher child maltreatment was associated with living in smaller households (r = − .255, p < .001), currently not attending school (t = 3.302, p < .001), frequent changes in place of residence (r = .138, p < .05) and having more siblings (r = .211, p < .001). There was no difference observed on gender (t = 0.198, p = n. s.). However, increased age was found to be associated with more maltreatment (r = .431, p < .001)..

Cross-informant agreement

The inter-informant correlations for the maltreatment scores in the present sample were low, ranging from .011 to .191 (Table 2). Correlations between children's self-reports and caregivers' accounts on composite maltreatment, neglect, and psychological abuse were significant at alpha levels of $p < .001$, $p < .01$ and $p < .05$ respectively. Correlations on physical abuse and domestic violence of burden between self-report and informants did not reach significant levels. Interestingly, in the present analyses caregivers and parents (informants) reported significantly higher levels of total maltreatment ($t = 13.036$, $p = .001$), psychological abuse ($t = 27.119$, $p = .001$) and physical abuse ($t = 8.914$, $p = .001$) compared with reports from the children (Table 2). However, children reported more domestic violence ($t = 11.046$, $p = .001$) and neglect ($t = 4.054$, $p < .001$) than their informants.

Table 2
Comparisons of Scale scores across respondents using Paired Sample Statistics (n = 286)

Source	**Children self-report**	**Informant report**	**t sig.**	**Inter-informant correlation** **r sig.**
Domestic Violence	3.37	2.10	11.046 .001	.066 n. s.
Mean	1.45	1.40		
SD				
Neglect	4.29	3.69	4.054 .001	.140 .01
Mean	1.66	2.04		
SD				
Psychological Abuse	3.40	8.31	-27.119 .001	.121 .05
Mean	1.68	2.80		
SD				
Physical Abuse	2.67	12.14	-8.914 .001	.011 n. s.
Mean	1.65	4.75		
SD				

Differences between OVC groups on Domestic Violence and Maltreatment

One-way multivariate analysis of covariance (MANCOVA) results revealed statistically significant differences in child maltreatment by the 4 groups on the composite dependent variable – overall multivariate effect after controlling for relevant sociodemographic variables, [$F (4, 284) = 16.824$, $p < .001$; Wilks' $\lambda = .533$; partial $\eta 2 = .189$]. The orphanhood groups accounted for 18.9% of the variance in the combined dependent variable scores of child maltreatment, reflecting a large effect size. On the self-reported levels of overall child maltreatment, children living with HIV/AIDS-infected parents (**t** = 3.650, p

< .001), children orphaned by AIDS (**t** = 3.304, p < .001) and orphans of other causes (**t** = 2.750, p < .001) all reported significantly more maltreatment than comparison children. The Univariate tests of between-subject effects were employed to assess the statistical significance of each of the four components of maltreatment under consideration (see Table 3). The Univariate analysis indicates significant group differences between the orphanhood groups on witnessing domestic violence [F (3, 287) = 15.585, p < .001, partial η2 = .14]. Bonferroni adjusted alpha level of (p < .01; i.e., .05/4) was used in all subsequent multiple comparison since there are 4 components of maltreatment. The results showed that children living with HIV/AIDS-infected parents reported higher adult fights and quarrels (domestic abuse) in the home than both other orphan groups (**t** = 0.886, p < .01) and comparison children (t = 1.320, p < .001). Children orphaned by AIDS on the other hand also reported significantly more domestic violence than other orphaned children (**t** = 0.698, p < .01) and comparison children (**t** = 1.132, p < .001). No further group differences were found. The Psychological abuse subscale of the maltreatment score exhibited the same pattern, where OVC scored higher than comparison children [F (3, 287) = 47.019, p < .001, partial η2 = .33]. However, only children orphaned by AIDS (**t** = 0.970, p < .001) and children living with HIV/AIDS infected parents (**t** = 0.718, p < .01) reported significantly higher levels of neglect compared with comparison children. Finally, only AIDS orphaned children reported significantly higher physical abuse compared with comparison children (**t** = 0.761, p < .01).

Table 3
MANCOVA Results showing Orphanhood Group differences on Child Maltreatment

Source	Comparison group of children (n = 100) [1]	Orphaned and vulnerable children			F		
		AIDS-orphaned children (n = 74) [2]	Other-orphans (n = 67) [3]	Children with HIV/AIDS-infected parents (n = 50) [4]		Partial η2	Observed Power
*Domestic Violence (M, SD)	2.76 (1.27)	3.89 (1.42)	3.19 (1.44)	4.08 (1.24)	15.585 c	.140	1
*Neglect (M, SD)	3.85 (1.49)	4.57 (1.79)	4.22 (1.60)	4.82 (1.71)	4.920 b	.049	.91
*Physical Abuse (M, SD)	2.32 (1.66)	3.08 (1.55)	2.63 (1.58)	2.80 (1.74)	3.242 a	.033	.74
*Psychological Abuse (M, SD)	2.08 (1.30)	3.91 (1.410	4.15 (1.45)	4.28 (1.42)	47.019 c	.330	1
***Adjusted for sociodemographic variables (age, gender, household size, number of siblings, changes in residence and current educational status)**							
[a] Denotes significance at the 0.05 level, [b] denotes significance at the 0.01 level, [c] denotes significance at the .001 level							

Discussion

Cluver et al. [36] noted that there is no reliable data on exposure to or experiencing of child abuse among families affected by AIDS in developing countries due to poor reporting and recording of abuse incidences. The present analysis provided quantitative examination of child maltreatment disparities among children affected by HIV/AIDS. Evidence from the present analysis highlighted significant differences between the various orphanhood groups on reports of maltreatment. A key finding from the present analysis is that maltreatment of children was significantly higher among OVC compared with comparison children. Children orphaned by AIDS and children living with HIV/AIDS-infected parents reported more domestic violence than other children. This could be an indicator of the significant physical and emotional burdens of the HIV/AIDS illness and the strain that the disease has on family relationships. Lachman et al. [28] noted that HIV/AIDS increases the intensity and frequency of quarrelling and fighting among family members or couples. This is consistent with assertions that children who reside in families affected by HIV/AIDS are at risk of exposure to abuse [23]. Orphans from other causes also reported more domestic violence than comparison children. Orphans, regardless of the

cause of their parental death and children living with HIV/AIDS-infected parents are at high risk of abuse (psychological and physical) and neglect by their caregivers who should be providing protection and guidance. This present evidence contradicts the finding of Nyamukapa et al. [37] that child abuse was similar among both orphans of AIDS and comparison children but consistent with claims that many OVC suffer cruel and impersonal care-giving from their new caregivers [38]. One explanation for the current evidence could be that the traditional family support system and network might have been overwhelmed by the soaring numbers of OVC which increases the likelihood of abuse and neglect [10, 15]. In the present analysis, the fact that child maltreatment was negatively associated with household size and positively with the number of siblings living in household supports this postulation. That is, interestingly, it is larger numbers of adults in the household that is important to buffer child maltreatment. Another plausible explanation could be the high levels of HIV/AIDS related stigma, discrimination and social exclusion found among OVC; as increased incidence of child maltreatments is consistently reported among socially isolated families with inadequate community networks and ties [39]. These findings are indications that there are differences in the family structures that children affected by HIV/AIDS and comparison children find themselves.

Approximately 90% of OVC reported some form of maltreatment within the household. Eight out of ten children reported having been disciplined with a belt, stick or other hard object, 72% had been punched or slapped by adults, 65% have been called funny names and 69% had been threatened with expulsion from their homes. These prevalence rates are two to three times higher than those found among OVC in a community survey in South Africa [19], highlighting the worrying nature of the present finding for Ghanaian children. However, various factors could explain this observation. First, South Africa outlawed the use of corporal punishment both in schools and households three decades ago and has consistently enacted and implemented policies to enforce it [40] whilst Ghana on the other hand just recently outlawed corporal punishment in schools and not in homes. Although outlawed, the existence of corporal punishment in schools is real in Ghana. Parents' and guardians' frequent use of corporal punishment and other cruel disciplinary measures in the homes is considered culturally acceptable and violates no legal act thus compromising children's right to protection from environmental and physical assaults. Second, South Africa, with a more mature HIV/AIDS epidemic, has implemented several interventions and campaigns (economic, psychosocial, educational etc) for families affected with AIDS [41]. These interventions, although not necessarily directly targeting domestic violence and maltreatment, may have enhanced guardians coping mechanisms and boosted children's social support networks which consequently protected OVC from being maltreated. Third, many severely maltreated and neglected OVC are not captured in community surveys because, as part of South Africa's government sponsored policies, they are sent to residential care [42]. Ghana has no such residential policy for maltreated OVC and so they are found within the community. This is evident by the fact that higher levels of abuse are reported in South African orphanages and institutional care accommodating OVC than in the community [43]. Clearly, political, legal and cultural variations in patterns of child-rearing practices between South Africa and Ghana are real and important factors explaining the differing levels of reported maltreatment observed in the two countries.

Contrary to public health assumptions, caregivers and parents in the present study reported higher child maltreatment compared to the children's own report whilst children, however, reported higher levels of domestic violence than their guardians. This may be a reflection of parents' social and cultural acceptance of harsh child rearing practices. It could also be deduced that parents are being selective (social desirability bias) by under-reporting experiences of domestic violence because they might be victims or perpetuators of it. Evidence suggests that whilst third parties are particular likely to report household violence involving others, domestic violence between people who knew each other, particularly couples, were less likely to be reported by either the victim or the perpetuator [44]. Godinet et al. [33] found that girls are maltreated more than boys. The present study failed to find any gender difference on maltreatment. Number of changes in place of residence (household migration) was significantly associated with more maltreatment. Speculatively, it may be that children who are being abused by their guardians are constantly on the move to try and escape the violence. Consistent with findings in South Africa, in the present study increased age was associated with more maltreatment [19]. Finally, in the present study, living with many siblings in the same households was related to higher maltreatment whilst larger household size was associated with less maltreatment. This suggests that it is better for OVC to live in households with many adults than in households with several minors. Certainly, these identified significant associations between child maltreatment and relevant socio-demographic factors may be important in developing developmentally and contextually appropriate interventions that would alleviate child maltreatment among children affected by HIV/AIDS.

Limitations and Future Research

The cross-sectional design did not allow for any conclusions to be drawn regarding causal relationships because exposure (contextual factors and HIV/AIDS exposures) and event (child maltreatment outcomes) were measured at the same time. Because data were collected at one point in time, the direction of causation is not implicated in this study. The second limitation of this study is that all the data reported in this present study were based on retrospective, self-reporting by both children and their parents or caregivers, which were subject to self-reporting bias (e.g., recall bias, social desirability effect and self-selection). This issue is particularly relevant to child maltreatment and HIV/AIDS measures because topics related to these are sensitive in African cultures. Finally, some important information related to child maltreatment was not available for analysis (e.g., age at onset of the abuse, timing of abuse in relation to parental HIV/AIDS status or death, relationship with perpetrator). Future study that captures such information may provide greater insight into the contexts of child abuse and information on appropriate and effective child protection and psychosocial support to children affected by HIV/AIDS in Ghana.

Conclusions and implications

Although child maltreatment is a serious and common problem in Ghana, surveys with rigorous research design, such as stratified random sampling method and multi-informant perspectives used here, are not common. This study found that among OVC, the prevalence of maltreatment was 90%. Furthermore, children who live with many minor siblings, are of older age, changed residence frequently and are

currently not attending school were identified as being at significant risk of maltreatment. These significant predictors of child maltreatment could provide important information for planning future preventive measures. More attention should be paid by health professionals to children affected by HIV/AIDS as they represent the at-risk children for maltreatment.

Declarations

Ethics approval and consent to participant: Informed consent was obtained from the parents and guardians of all participants. The study protocol was approved by the institutional Research Ethics Review Boards of the University of Glasgow and the Ghana Health Service prior to recruitment of children. The author asserts that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

Consent for publication: Not Applicable.

Availability of data and material: The dataset used and/or analyzed during the current study are available from the corresponding author upon reasonable request

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