

# Chronic Wounds in Children: Prevalence, Aetiological Types and Predilection Sites in a Rural Setting in an Emerging Economy

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## Abstract

The aim of this study was to determine the prevalence, aetiological types and predilection sites of chronic wounds in children. This study was a cross sectional study conducted on children aged 0-15 years. Through cluster sampling technique, children with wounds were recruited and evaluated. Demographic and clinical data were collected and analyzed. Descriptive statistics were used to summarize variables and Chi-squared test was used to achieve comparison between age groups and sexes. Statistical significance was defined as  $p < 0.05$ . The results show that one thousand and ten children were screened for wounds out of which 107 children with 115 wounds were found. 16.5% of these wounds were chronic with a prevalence rate of 2.0%. Chronic wound prevalences in the school aged (47.4%) and adolescent (52.6%) children were 0.9% and 1.0% respectively ( $\chi^2 = 0.821$ ;  $p = 0.359$  Yates' corrected, Fisher's exact test 2-sided) and statistically insignificant. 57.9% were caused by trauma and majority (89.5%) occurred in the lower limbs ( $\chi^2 = 0.000$ ;  $p = 1.000$  Yates' corrected, Fisher's exact test 2-sided) without any statistical significance. Prevalence of chronic wounds in the children population was very low. The commonest aetiological type was inadequately treated traumatic wounds which progressively healed on institution of appropriate wound treatment.

**Keywords:** Chronic wounds; Prevalence in children; Aetiological types; Predilection sites; Emerging economy.

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## **1. Introduction**

Wounds are termed chronic if they failed to heal by attaining sustained and functional anatomic result after a period of about 6-8 weeks [1]. Wounds in healthy individuals heal within three weeks, if there are no factors that will inhibit healing [2]. In children, tissue defects are reported to close faster, because fibroblasts are more abundant, collagen and elastin are more rapidly produced and granulation tissue forms faster than it does in adults [3-4]. Furthermore, it is believed that younger individuals and children tend to be free from comorbidities, such as coronary artery disease, peripheral vascular disease, diabetes and pulmonary compromise which affect the wound healing process in the older ones [5]. Consequently, it is claimed that, chronic wounds are rarely seen in individuals who are otherwise healthy, let alone children [6]. In fact, patients with chronic wounds are thought to suffer from “highly branded” diseases such as diabetes and obesity [6]. It was on this basis that chronic wounds were aetiologically classified into four namely pressure ulcer, diabetic ulcer, venous ulcer and arterial insufficiency ulcer [7].

In rural settings, however, it is reported that inadequate wound treatment or the lack of it may give rise to chronic wounds in patients who are otherwise healthy [8]. For this category of patients, wound infection, foreign body or necrotic tissue and repeated trauma may further enhance the development of chronic wounds [8-9]. Hitherto, literature on the prevalence of wounds in children is scarce [10]. More so there is a dearth of data on the burden of chronic wounds variety in children. This study therefore was aimed at determining the prevalence, aetiological types, predilection sites and management outcome of chronic wounds in children as well as the age and sex distributions.

## **2. Methods**

This was a cross sectional study conducted in March, 2016 on children aged 0-15 years from new Bakassi, a resettled rural community of displaced people in Cross River State, Nigeria. Institutional consent was obtained from the Cross River State Research / Ethics Committee and informed consent was gotten from their parents / guardians to also permit taking of clinical photographs for medical illustration. Through cluster sampling technique, the study population was divided into clusters of homogenous population units of 6,017 households. A household was defined as a person or group of persons, related or unrelated, who usually lived together in the same dwelling unit, have common cooking and eating arrangements and acknowledged one adult member as the head of the household [11]. The average household size in Nigeria was given as 4.6 persons [11]. The sampling units therefore were the households while the sampling frame was the resettlement register which contained the list of households in the settlement. From a derived sampling interval of 14, the first household was randomly selected. Subsequently, every 14<sup>th</sup> household was systematically picked from the register and a total of 430 households were selected. The researcher and his assistants then moved from house to house to identify children in the selected household units and screened them for the presence of wounds whether acute or chronic using a semi-structured questionnaire with three main components.

A detailed clinical history and physical examination were conducted in the field on all children found to have wounds to diagnose any underlying disease. Relevant investigations were recommended and performed at the

expense of the researcher for respondents who had wounds with a positive history of diabetes mellitus such as polyuria, polydipsia, polyphagia, weight loss and generalized body weakness [12].

A sony cyber- shot 13.6 mega pixels digital camera was used to take photographs of encountered wounds for medical illustration and documentation. The photographs were taken before and after wound debridement by the researcher followed by simple gauze dressing with local honey. Dressings were continued on alternate days at the Community Health Center by two Community Health Nurses co-opted for that purpose until wound healing was achieved. Oral antibiotics using 500 mg capsules of Beecham Ampiclox and 200 mg tablets of Metronidazole were empirically given at appropriate dosage to children with chronic wounds for a period of one week along with 100 mg tablets of vitamin C for two weeks. Wounds with irregular and nodular appearance of the surface, raised or rolled in edge, raised granulation tissue and indurated base were considered suspicious for malignancy [13] and were referred for biopsy and histological evaluation.

The data collected were age, sex, ethnic group, Address, cause of wound, place of wounding, site or location of wound, duration and complication as well as clinical photographs and significant findings from the history and physical examination.

Data were analyzed using Statistical Package for Social Sciences (SPSS) statistic for windows (version 20.0 Armonk, NY; IBM Corp) and Computer Programme for Epidemiologic Analysis (CPEA). Descriptive statistics (frequency, proportions, means and standard deviation) were used to summarize variables. Chi-squared test was used to achieve comparison between the age groups and sexes. Statistical significance was defined as  $p < 0.05$ . Yates' correction for continuity was applied to 2 by 2 tables and Fisher's exact test (14) to tables with small samples of 20 cases or fewer.

### **3. Result**

One thousand and ten children from 408 households were screened for wounds giving an average (1010/408 households) of about 3 children per household. Seven households were excluded because their children were older than 15 years, while in five others, they were not available to participate in the study on the study days.

In all, there were 115 wounds in 107 children, with an overall wound prevalence rate of 11.4% (115/1010 children). 16.5% (19/115 wounds) of these wounds were chronic giving a chronic wound prevalence rate (19/1010 children) of 2.0%. There were no cases of multiple wound pathologies in the children. The age range was 6 -15 years with a mean age of  $10.79 \pm 2.74$  years. Boys were about thrice (Table1) more likely to have chronic wounds than girls, giving an M:F ratio of 2.8:1.

Chronic wounds were not seen in children aged five years and below in this series. However, the chronic wound prevalences of the school aged (47.4%) and adolescent (52.6%) children were 0.9% (9/1010 children) and 1.0% (10/1010 children) respectively ( $\chi^2 = 0.821$ ;  $p = 0.359$  Yates' corrected, Fisher's exact test 2-sided)(Table 1).

**Table 1:** Age and sex distribution of children seen with chronic wounds

Age (years)	Female	%	Male	%	Total	%	p-value
6-10	1	5.3	8	42.1	9	47.4	$X^2= 0.821$
11-15	4	21.0	6	31.6	10	52.6	P=0.365 Yates' corrected; Fisher's exact test 2-sided.

This was not statistically significant. This meant that the proportion of school aged children who had chronic wounds was not significantly different from the proportion of adolescent children who had chronic wounds in both sexes. Therefore, there appeared to be no association between chronic wounds and age and sex.

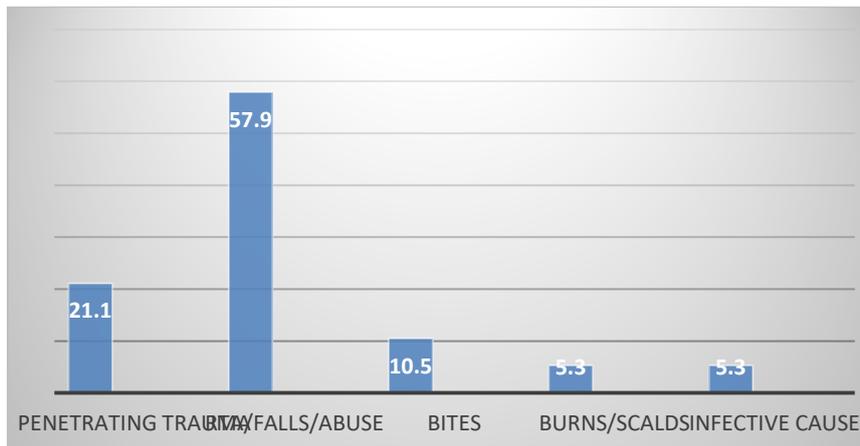
Majority of the chronic wounds (n=17/19, 89.5%) occurred in the lower limbs, predominantly affecting the right leg in 42.1% (8/19) of cases, followed by the left (n=4/19, 21.0) and right (3/9; 15.8%) feet respectively. The face, upper-limbs, as well as the left leg made only minute contributions of 5.3%, 5.3% and 10.5% in that order (Table 2) ( $x^2=0.000$ ; p=1.000 Yates' corrected, Fisher's exact test 2-sided).

**Table 2:** Sites of occurrence of chronic wounds in the various age groups

Age (years)	Face/ Upper L	%	Lower Limbs	%	Total	%	p-value
6-10	1	5.3	8	42.1	9	47.4	$X^2= 0.000$
11-15	1	5.3	9	47.3	10	52.6	P=1.000 Yates' corrected; Fisher's exact test 2-sided.

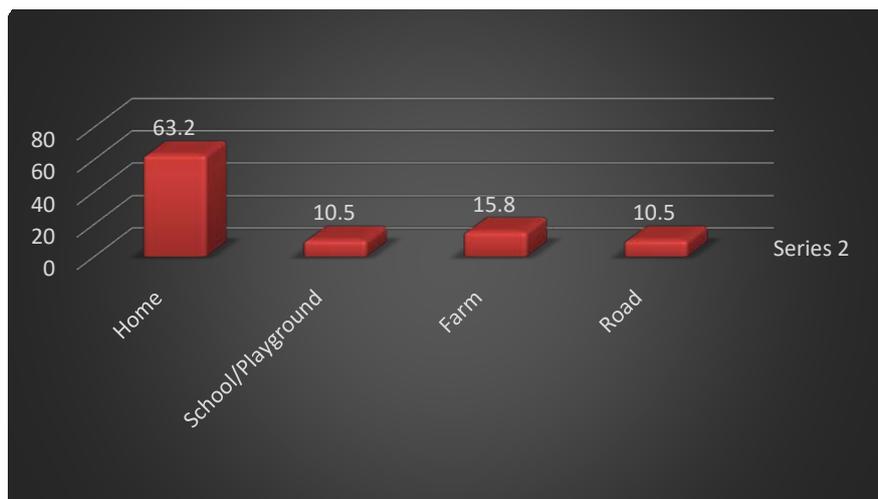
This was also not statistically significant. This meant that the proportion of school aged children who had chronic wounds on the face / upper limbs and lower limbs was not significantly different from the proportion of adolescent children who had the same wounds on the face / upper limbs and lower limbs. Therefore, there appeared to be no association between chronic wounds and location of wounds whether on the upper limbs and lower limbs. There were no chronic wounds on the trunks, buttocks and the perineum of the children.

Aetiologically, the major primary cause of the wounds that had become chronic was trauma such as falls (while running, playing or from height) as well as motor bicycle accidents (n= 11/19; 57.9%) (Figure 1).



**Figure 1:** Primary causes of wounds that became chronic in children

Bite wounds (n=2/19; 10.5%) were observed affecting the face and upper limb. There were no children with sickle cell ulcers, diabetic ulcers or ulcers with features suggestive of malignancy. The injury occasioning wounds in majority of the cases, occurred at home (n=12/19; 63.2%), school or the playground (n=2/19, 10.5%) environments with which the children appeared to be very familiar with (Figure 2).



**Figure 2:** Places of injury resulting in chronic wounds in children

Yet, in 10.5% (2/19) and 15.8% (3/19) of cases, the injury occurred on the road and farm respectively.

In all, the majority of the wounds (n=16/19; 84.1%) had been present for six to 12 weeks. In a few other cases, however, the duration of the wound was between 6 -12 months (24-48 weeks) in two children (Figure3) and beyond 12 months in another child with chronic osteomyelitis with multiple sinuses (Figures 4).



**Figure 3:** A 6 - month old chronic wound in a child – before and after cleaning



**Figure 4:** An 18 - month old wound now turned chronic osteomyelitis in a child

Wound healing was achieved in more than half (n=10/19; 52.6%) of the cases by three weeks of commencement of simple wound dressing with local honey. In the others (n=8/10; 42.1%) the healing process was progressing satisfactorily. None of the cases needed referral for more sophisticated dressings or a skin grafting. However the one case (5.3%) with chronic osteomyelitis was referred to a tertiary Health facility for appropriate management.

#### **4. Discussion**

The findings of the study revealed that the prevalence of chronic wounds in children was very low. This observation was in agreement with the assertion that chronic wounds were rarely found in individuals who were otherwise healthy [6] due to the fact that they lacked the comorbidities which usually affected the wound healing process in older people [5]. The fact that chronic wounds were more preponderant in boys than in girls was in keeping with findings from other studies [10] and was attributed to a higher predisposition to injury.

Similarly, the age range of children with chronic wounds was similar to that usually reported in other studies [10]. However, while Pieper et al [10] reported occurrence of wounds in children who were less than one year old, our series did not find wounds in children who were five years old and below. This may be due to the fact that acute wounds were excluded from this series.

The results of the study showed that school aged and adolescent children were those commonly diagnosed with chronic wounds. This finding was in agreement with other studies [10].

Similarly, the study demonstrated that nearly all the chronic wounds occurred in the lower limbs similar to other studies [15] but that the sites of the wounds were at variance with the sites frequently reported for vascular ulcers [16-17]. The commonly reported sites for vascular ulcers include; medial malleoli for sickle cell disease ulcers; distal leg, on dorsum of foot or toes for ischaemic or arterial ulcers; lower third of leg (gaiter area), majority at medial malleolus for venous ulcers; and pretibial area and dorsum of foot for ulcers arising from vasculitis [16-17]. The fact that there were no chronic wounds on the trunks, buttocks and the perineum of the children in this series need not be interpreted to mean that these sites were exempt from developing the condition. Chronic wounds such as pressure ulcers do develop at these sites when children are bedridden or have limited ability to reposition themselves [18]. Similarly, other conditions such as poor nutritional states, as may be found in developing economies and urinary or faecal incontinence leading to moistening of the skin may predispose to developing chronic wounds at dependent sites in children [18].

Aetiologically, the study showed that most of the wounds were caused by trauma in the form of falls whether during running, playing or from heights as well as motor bicycle accidents. Ideally, such traumatic wounds in healthy children should heal within three weeks or at most 6 weeks [1-2]. However, our study found out that these wounds failed to heal and became chronic due to inadequate care or the complete lack of wound treatment. This observation agreed with those of other studies [8]. An uncommon type of chronic wound found in this study was that following human bites. It has been stated that bite wounds often appeared deceptive while serious damage went on below the skin due to inoculation of bacteria direct into subcutaneous tissue particularly in puncture wounds because human mouths carried a high population of resident bacteria [19]. Other aetiological types of chronic wounds sometimes seen in children which we did not find in this series were sickle cell ulcers [20] and fungating malignant wounds such as soft tissue sarcomas [18] which are particularly common in children.

The study found that, majority of the injuries leading to wounds occurred at home. This was in agreement with

other studies [21-22]. This may be due to the fact that children generally spent more time at home than in any other environment.

As was found in this study, majority of the wounds had been present for six to 12 weeks. While in a few others, the wounds had been present for between 6 to 12 months or longer. These findings agreed with those of other studies [23].

The results of the study showed that majority of the wounds actually healed or were progressively healing once adequate care was instituted. These findings were in agreement with those of others [8, 23]. There were no wounds that needed to be referred for more sophisticated wound dressings or skin grafting except for the one case of chronic osteomyelitis which was referred for definitive management.

**Conclusion:** Despite the lack of adequate wound care in children in the rural setting in an emerging economy, the prevalence of chronic wounds was low. The commonest aetiological type was inadequately treated traumatic wounds which predominantly occurred in the lower extremities. To further evaluate the burden and morbidity of chronic wounds in children as well as their microbiology, a more expanded study would be required.

## **5. Definitions**

**School child:** a child aged from six to 12 years old. As used in this work refers to 6 to 10 years age range.

**Adolescent:** The time of life between childhood and adulthood ranges from 10 to 18 years. As used in this work refers to 10 to 15 years age range.

## **6. Recommendation**

We recommend that childhood wounds should be attended to promptly so as to obviate the challenge of chronicity and wound complications.

## **7. Limitations**

Only indigenous Bakassi children resident in the camp were examined. Those living elsewhere as well as non-indigenous ones in the community were not covered. The major limitation of the study was funds.

## **8. Consent**

Written informed consent was obtained from the patients' legal guardians for publication of this manuscript.

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### Competing interests

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