Original research Articles

PREVALENCE OF ECTOPARASITES OF INMATES IN THE BAMENDA CENTRAL PRISON, NORTH WEST REGION OF CAMEROON

ABSTRACT:

Background: The purpose of this study was to determine the prevalence of ectoparasites of inmates in the Bamenda Central Prison, Mezam Division, North West Region of Cameroon.

Method: Three hundred and ninety three (385 males and 8 females) inmates aged 16 to 84 years were physically examined in 14 Cells in the prison between September 2014 and February 2015. Inmates age below 17 years old were examined in their Juvenile Cell.

Result: Of the 393 inmates physically examined, 335 (85.24 %) were positive for one or more ectoparasites. From the results obtained, lice showed the highest prevalence of 76.33% while jiggers were the least with a prevalence of 2.29%. Out of the 385 males examined, 336 (85.49%) had ectoparasites while amongst females, only two were suffering from ectoparasites. The trend of infestation for these ectoparasites was relatively high. Multiple infestations were more common than single infestations with the adult inmates more infested than the younger ones.

Conclusion: These results showed that ectoparasites vary in relation to different Prison Cells and age of the inmates. There should therefore be need to educate the prison population on hygienic habits, reduce overcrowding amongst inmates, in order to fight effectively against these diseases in the Prison Community.

Keywords: Prevalence, Ectoparasites, Inmates, Bamenda.

1.0 Background

A parasite is an organism in intimate association with another organism called the host (usually of different species), and which satisfy their metabolic requirements to varying degrees at the expense of the host [1]. These parasites reside on or within the host in other to find the environment and nutrients required for their own growth and production [2]. Parasites can be classified in many ways, according to the life cycle, position in or on the host or other

features. Based on position in or on the host, we have ectoparasites which are organisms which reside temporarily or permanently on the body of their host, usually attached to the skin [3]. Ectoparasites are distributed worldwide, particularly in the tropical and sub tropical areas [4]. Around the world, a significant percentage of individuals (inmates) enter the prison already infested with ectoparasites which can be transmitted from one person to another. Other people become infested when they visit the prisoners and when they come back home, they can also transmit the infestations to their neighbors. Several studies have shown that ectoparasites infest individuals living in exposed areas like prisons especially in developing countries. The action of these parasites on man can concern the alteration of their health state and the reduction of their reproductive success and affected individuals show a generalized bronze pigmentation and hardening of the skin especially in the case of lice [5, 6].

Scientific studies carried out in the world have shown that prison inmates are mostly infested with intestinal parasites and other forms of illness [7, 8, 9, 10]. Other studies according to [11] have shown that all age and sex groups in prisons suffer from these parasite infestations and other diseases. Infestations are high among populations who are heavily exposed in low income countries, in 720 million clinical cases, an estimate of 135,000 deaths attribute to clinical complications annually [12]. It is estimated that 3.5 billion people are infested with these diseases, and that 450 million inmates in the world are ill as a result of these infestations. Studies carried out by [13] amongst inmates in Maiduguri, Nigeria revealed that 77 (64.20%) out of 120 inmates are infested every year. This means that inmates in prisons are at a very high risk of becoming infested as some are released, others are being detained at any moment. In Cameroon, similar studies were carried out by [14] in the Dschang Prison, West region which also showed a very high prevalence of 88.54% amongst inmates. The high prevalence of these parasites in prisons in most developing countries like Cameroon is promoted by several factors such as poor hygiene and sanitation, overcrowding, sharing of personal belongings and beddings, and lack of appropriate lodging in prisons.

In response to this problem, the WHO Health in Prisons Project has introduced the concept of health in prisons or health-promoting prisons and this phrase covers prisons in which the risks to health are reduced to a minimum. [15] further listed the essential steps in setting up health in prisons. These include the staff and the senior management who determine the prison climate and the creating of strong links between prison health care services and the health services of the local community. These essential components thus involve people at a political level, the staff, the prisoners, and the local community health system. Thus the

Ministry of Justice and Penitentiary Services in partnership with the Prison Administration are modernizing and ameliorating the living conditions, hygienic and sanitation status of the inmates. This is done by making sure that inmates have clean beddings, sanitary bathing, and above all good prison cells. In order to reduce practices that lead to contamination, the prison officials are strongly discouraging inmates from sharing personal belongings, combs and other potentially contaminated items because these items serve as vehicles for propagating infestation. Most of these diseases are preventable, and thus high prevalence rates suggest inadequate preventive measures.

We understand that poor hygiene and sanitation, and poor management practices are factors which directly influence the health status of an individual. It has been established that in most developed countries, inmates in prisons are usually malnourished when infested, a situation contributing to their poor health, and thus decreased immunity. Based on these findings, we therefore ask if ectoparasites are not major contributors to the health challenges faced by these individuals. We then coined the hypothesis that the prevalence of these parasites may be high in inmates of the Bamenda Central Prison because they usually harbor factors that predispose them to common infestations. It is for these reasons that the principal objective of this study was to identify the ectoparasites that infest inmates in this Prison.

2.0 Methods

2.1 Area of study

This study was carried out between September 2014 and February 2015 in the Bamenda Central Prison found in Bamenda I in the Mezam Division, North West Region of Cameroon. Bamenda I is located between latitudes $5^0$43N and $6^0$10S, and longitude $9^0$55E having a surface area of 110km^2. It has a total population of 16,000 inhabitants [16]. The climate of Bamenda is typically tropical with two seasons, the dry season and the rainy season. The rainy season begins from about mid March to sometimes in mid October. The dry season begins from mid October to about mid March. The temperature in the dry season sometimes go as high as 38^0C during the day and as low as 15^0C at night. In the rainy season, the temperature is generally milder with an average daily temperature of about 25^0C. The climate is gradually reducing conferring a high rainfall and a conducive environment for most ectoparasites.

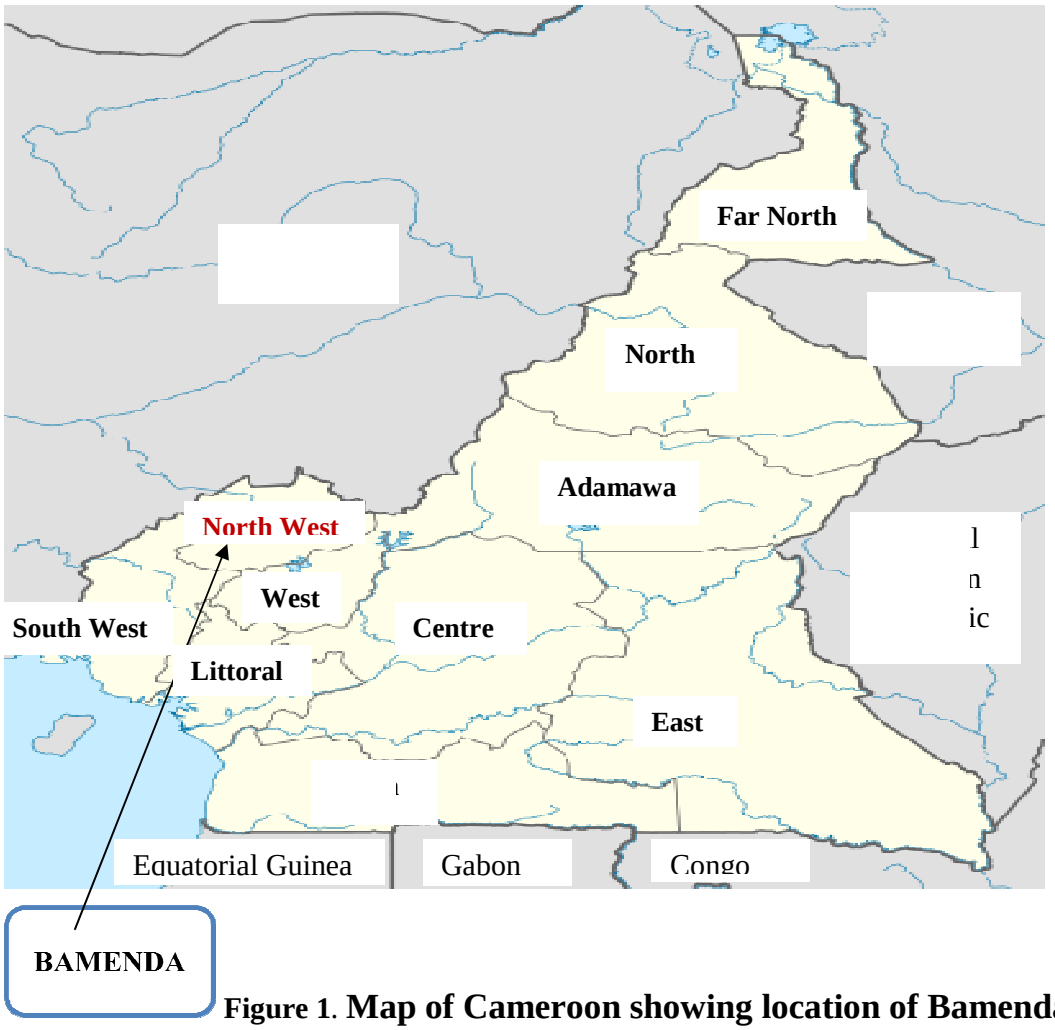

Figure 1. Map of Cameroon showing location of Bamenda

2.2 Type of study

A Prevalence study was carried out in the 14 Cells of the Bamenda Central Prison. The inmates were physically examined for the presence or absence of ectoparasites in all the Prison Cells inside the Prison.

2.3 Ethical clearance

To carry out this research, an ethical clearance was obtained from the National Ethics Committee of Cameroon, in order to ensure consent and confidentiality of the participants with Registration number 1055.

2.4 Study design

A descriptive study was carried out in which inmates were physically examined for the presence of ectoparasites.

2.5 Sampling

2.5.1 Sample size

The participants were 393 aged 16-84 years old and randomly selected from 14 cells. The sample size was determined through a simple randomized sampling method.

2.6 Distribution of Questionnaires

Questionnaires were distributed to the delegates of the different cells. The questionnaires were taken to the different cells in the evening to be filled by the inmates willing to participate. The questionnaires were then brought back the following day and handed to the researcher.

2.7 Collection of questionnaires

Inmates who filled the questionnaire forms and with a signed informed consent were recruited for the study.

2.8 Dermatological profile

Inmates were physically examined by the Principal Investigator together with the ‘‘Clinician’’(the Prison Nurse) and the presence of lice, scabies, eczema, jiggers, bedbugs, ringworm were noted on the questionnaire form. A positive diagnosis of lice and bedbugs infestation was established after catching or noticing them on their dresses meanwhile those who had pubic lice indicated on the questionnaires.

2.9. Statistical analysis

2.9.1. Mode of storage of raw data

Data was first recorded by manuscript in the form of Tables. The later contain: ages of inmates, the type of parasite found and its complete description. Then, the software to enter numerical data was Excel 2007. Data analysis was carried out using SPSS version 20 for Windows. Analysis was carried out in relation to sex, age and prison cells.

2.9.2 Statistical methodology

Both descriptive and inferential statistical procedures were used. Tables and graphs were used in displaying results. The Chi-square (χ^2) test of independence used to test the

hypothesis of whether parasitic diseases infest inmates independent of cells in which these inmates were detained and in relation to their ages. The level of significance was 5% test.

3.0 Results

3.1 Prevalence of ectoparasites in the study area

Three hundred and ninety three inmates were physically examined by the Prison Nurse and the Principal Investigator for the presence or absence of ectoparasitess. Three hundred and thirty five of them were infested with ectoparasites with an overall prevalence of 85.24%. The following seven types of ectoparasites were identified during the study with their respective prevalences; Lice (76.33%), scabies (20.86%), skin rashes(20.35%), bedbugs (18.32%), eczema (8.39%), ringworm (7.12%) and jiggers (*Tunga penetrans*) (2.29%). The chart below shows the prevalence of the different ectoparasites encountered amongst inmates.

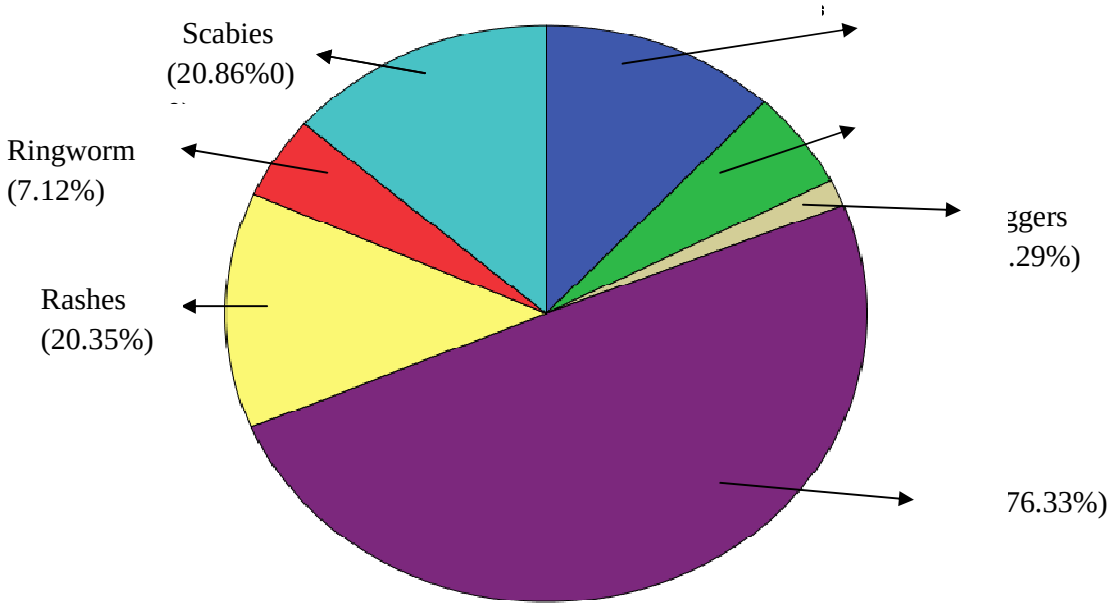

Figure 2: Prevalence of different ectoparasites identified in the Inmates

3.2 Sex-related prevalence of the different types of ectoparasites encountered during the study

In this study, not all males were infested with ectoparasites meanwhile only two females were infested with ectoparasites. Some inmates hard more than one infestations while other inmates were not infested at all. Table 1 below shows the prevalences of the different parasite types with respect to sex.

Table 1: Sex-related prevalence of the different types of ectoparasites encountered during the study

	MALES			FEMALES		
Type of Parasite	Number Examined	Number Infested	P (%)	Number Examined	Number Infested	P (%)
Lice	385	300	77.9	8	0	0
Scabies	385	81	21.0	8	1	7.14
Rashes	385	79	20.5	8	0	0
Bedbugs	385	72	18.7	8	1	7.14
Eczema	385	33	8.5	8	0	0
Ringworm	385	28	7.3	8	0	0
Jiggers	385	9	2.3	8	0	0
More than one infection	385	176	45.7	8	0	0
No Infestation	385	48	12.5	8	6	75

3.3. Influence of age on prevalence of ectoparasites on Inmates

The effect of age on prevalence of ectoparasites (Table 2) shows that the most infested were those whose ages fall between 20-29 years that is, the adults with a prevalence of 41.6% followed by those between the ages 30-39 years. The least infested were those whose ages fall between 10-19 that is, the Juveniles, with a prevalence of 4.4%. The table below shows the prevalence of infested inmates following the various age groups.

Table 2: Influence of age on prevalence of ectoparasites on Inmates

Age Range (Years)	Number Infested	Prevalence (%)
10-19	15	4.4
20-29	141	41.6
30-39	89	26.2
40-49	40	11.8
50-59	34	10.0
60^{+}	20	5.9

3.4 Frequency of association of single, double and multiple ectoparasite infestations

Two types of multiple associations (single and double infestations) were identified. Of the 335 inmates infested with ectoparasites, 171 had monoparasitism, which was more frequent (43.76%) than double (25.66%) and triple (13.74%) parasitic infestations. Table 3 shows the combinations of different ectoparasitic associations. In monoparasitic infestation, lice were the most prevalent (38.42%), followed by bedbugs (3.56%) while scabies had a very low prevalence (1.78%). In double associations**,** several types of combinations were realized: the most prevalent was lice + skin infestations (12.47%), followed by lice + bedbugs (5.85%), lice + scabies (5.59%) and the lowest was scabies + jiggers (0.25%). In triple associations, three types of combinations were realized: the most prevalent being lice + scabies + other skin infestations (6.11%), followed by lice + scabies + bedbugs (2.03%) and the lowest was lice + scabies + jiggers (0.5%).

Table 3: Prevalence and types of association of single, double and multiple ecto-parasite infestations of inmates.

Type of Parasitism	Number (%) Infested
Monoparasitism	171 (43.76%)
Biparasitisme	101 (25.66%)
Multiple Parasitism	54 (13.74%)
Total	335 (85.24%)
Lice	151 (38.42%)
Bedbugs	15 (3.56%)
Scabies	7 (1.78%)
Lice/Skin infestations	49 (12.475%)
Lice/bedbugs	23 (5.85%)
Lice + scabies	22 (5.59%)
Bedbugs/jiggers	2 (0.5%)
Scabies/ Skin infestations	2 (0.5%)
Lice/jiggers,Scabies/bedbug	1 (0.25%)
Lice/scabies/other infestations	24 (6.11%),
Lice + scabies + bedbugs	8 (2.03%)
Lice/bedbugs/Skin infestations	7 (1.78%)
Lice/scabies/jiggers	2 (0.5%)
Scabies/bedbugs/other infests	1 (0.25%)
Lice/scabies/bedbugs/other infests	9 (2.29%)
Lice/scabies/bedbugs/jiggers	3 (0.76%)

3.5 Prevalence of ectoparasites with respect to Prison Cells

The Cell with the highest prevalence of ectoparasites was Cell B while the Female Wing and WC had very low prevalences (Table 4).

Table 4: Prevalence of ectoparasites with respect to Prison Cells

Name of Cell	Ectoparasites	Prevalence (%)
A ward	75	19.08
B ward	80	20.35
C ward	38	9.67
D ward	23	5.85
E ward	36	9.16
F ward	30	7.63
Female wing	2	0.51
G ward	9	2.29
H1	15	3.81
H2	13	3.31
Infirmary	2	0.51
Juveniles	5	1.27
Special Cell	5	1.27
WC	2	0.51
TOTAL	**335**	**85.24**

3.6 Factors responsible for Disease causation amongst Inmates.

The high prevalence of ectoparasites in prisons is promoted by several factors such as poor hygiene and sanitation, overcrowding, sharing of personal belongings, lack of appropriate lodging and medical facilities such as toilets, beddings and portable water in prisons. The factors are examined in the table below with their respective prevalences.

Table 5: Epidemiological Report from the survey.

Characteristics	**Response**	**Total (n=393%)**	**Prevalence (%) (n=393%)**
ENVIRONMENTAL HYGIENE AND SANITATION IN THE PRISON			
Type of toilets	Water/Bucket toilet	384	97.71
	Pit	9	2.29
Use of toilets	Always	313	79.64
	Sometimes	78	19.84
	Never	2	0.5
Cleaning of toilets	Always	393	100
Cleaning of cells	**Always**	393	100
Regular supply of water	**Yes**	269	68.45
	No	124	31.55
PERSONAL HABITS OF THE INMATES			
Change of beddings	**Always**	291	74.04
	Never	102	25.95
Exchange of dresses or combs	**No**	358	38.12
	Yes	35	8.90
Self bathing	**Always**	393	100
Ironing of dresses	**Yes**	61	15.52
	No	332	81.93

4.0 DISCUSSION

Based on the physical examination, seven different types of ectoparasites were identified. The presence of these ectoparasites may be due to the environment of these inmates, their personal hygiene and certain beliefs (like bathing everyday leads to fever or increases vulnerability to infection) contributed greatly to the high level of infestation noticed in this prison community. This study showed that ectoparasites were present in inmates from all the fourteen cells of the prison in the study area presenting an infestation rate of 85.24%. The following seven ectoparasites were identified in this present work with their respective prevalences; lice 76.33%, scabies 20.86%, skin rashes 20.36%, bedbugs 18.32%, eczema 8.39%, ringworm 7.12% and lastly jiggers (*Tunga penetrans*) with 2.29%. The overall prevalence recorded is slightly lower than 88.54% recoreded in Dschang Cameroon by [14]. This prevalence is higher than 59.80% recorded in Nigeria by [17]. The high prevalence of these ectoparasites recorded in this present study especially in male inmates could be associated to a good number of factors; Poor personal hygiene of the inmates (most of them don't bath often nor wash their beddings and dresses frequently). Absence of a pressing iron for dresses and beddings after washing. Lack of proper ventilation and sunlight in the cells also provide appropriate conditions for growth and multiplication of ectoparasites. The numerous cracks and crevices on the walls of the cells provide sufficient hiding places for some of the ectoparasites like bed bugs. The closeness of beds (overcrowding) in the prison cells favors cross-infestations especially in already immune-compromised persons [18, 19].

In this study, not all males were infested with ectoparasites whereas only two females were infested with ectoparasites. The prevalence of ectoparasites recorded in females might be because the female's single cell was relatively cleaner, less crowded and less congested than those of the males. In the male cells, there was closeness of beds with two inmates occupying a 1cm bed. Some male cells were too crowded with 100 inmates occupying a very small cell. The high prevalence of lice, scabies, skin rashes and bedbugs was as a result of the unhygienic conditions of the inmates [20, 21]. This could be because most of the inmates stay for several weeks without changing neither their clothes nor their beddings. The presence of these ectoparasites on the inmates's body may lead to regular scratching of the body as a result of itching. This can cause bleeding and sometimes secondary infection. This makes the individual inattentive, may lead to anemia and sometimes death. Eczema and ringworm recorded a low prevalence in this study. This low prevalence could be because most of the examined inmates were not actually suffering from these two parasites but could be suffering from other diseases. Amongst the male inmates, a relatively very low prevalence was

recorded for pubic lice. The low prevalence might be associated with the fact that, in contrast to other ectoparasites encountered which need close contact of dresses or body for transmission, pubic lice requires inmate contact [22]. In addition, the prohibition of intimate contact among inmates resulted to the low prevalence documented for pubic lice. Head lice were still present even though all the male inmates had very low hair. Body lice were also present and were the most prevalent of all the lice identified. The fleas species recorded in this study were jiggers (*Tunga penetrans)* with a very low prevalence. However, this species is endemic in Sub-Saharan African countries; [23]. The low prevalence of these fleas registered was probably because the inmates Cells have cemented floors, hence difficult contact. Furthermore, a significant difference ($P<0.05$) in prevalence of lice (76.3%), scabies (20.8%), skin rashes (20.3%), bedbugs (18.3%), eczema (8.4%), and ringworm (7.12%) was noted between the different prison cells, with cells A to F having a slightly higher prevalence of lice than the other cells. This is probably due to overcrowding in these cells as compared to the other cells in the prison. **[**23] indicated that high prevalence and intensity of infestation was due to close physical contact between individuals. Thus, overcrowding amongst the inmates provides the microclimate for easy transmission and survival of lice species and other skin infestations from the infested to the uninfested inmates.

Generally, it was noted that the prevalence of these parasites was 85.24%. The climatic conditions of Bamenda described as humid tropical climate as compared to that of the Menoua Division in the West region [24] is highly suitable for survival and transmission of these parasites. This explains why lice were more prevalent than other infestations. In the study area, Cell B recorded a very high prevalence of ecto-parasites, followed by Cells A, E, F, C and Cell D while the other Cells recorded very low prevalences. Observations from the study area reported that ecto-parasites were present in all the 14 Cells. In certain cases, the prevalence of ecto-parasites of infested and uninfested individuals could have slightly been the same, suggesting that even though not infested with the infestations in question, the uninfested inmates had other infestations [25, 26, 27]. It was equally observed from this study that most of the inmates had single infestation with an overall prevalence of 43.76%. 101 (25.66%) persons had double infestations while 54 (13.74%) persons had multiple parasitism. Mixed infestations either by two or more parasites has also been reported by other investigators [28, 29].

During the study, it was noted that there was a significant difference ($P<0.05$) between infestations with parasite and different prison cells. This can be attributed to overcrowding in some cells than in others. Out of the 393 inmates who were examined during the study, 54 inmates were found free of infestation. Furthermore, majority of the inmates refused to participate in the exercise due to ignorance and socio-cultural beliefs of fear to give detail information of themselves to an unknown person.

This work revealed that the general prevalence of ecto-parasites was relatively very high in the inmates. The seven types of ecto-parasites recorded in this study are of public importance because their intensity on affected inmates could be high, leading to general morbidity, persistent irritation, reduced feeding and weight loss, and sometimes death.

Conclusion

The present investigation was designed to study the prevalence ectoparasites of inmates in the Bamenda Central Prison (Mezam Division). It is worth noting that the prevalence of ectoparasites was relatively very high. This present investigation showed that lice had the highest prevalence, followed by bedbugs and lastly by jiggers. The prevalence of some skin diseases decreased from scabies, skin rashes to eczema and then to ringworm. Ectoparasitic infestations varied between the various age groups. The age infectivity varied within the ages and prison cells with high rates in adult male's Cells and very low rates in the single female Cell. This is due to overcrowding in the male cells than in the female cell which increases their risk of infestation. The result underscored the importance of proper hygiene and sanitation, reduce overcrowding by providing inmates with good numerous beds as this will reduce the infestation rate and the transmission of these ectoparasites.

Competing interests

We declare that we have no conflict of interest.

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SAMPLE OF THE QUESTIONNAIRES

All information given will be kept confidential.

Please fill the blank spaces and mark an X in the box corresponding to your answer.

GENERAL INFORMATION **Date…/…/ 20…….**

1-Name of Respondent: …….. Serial N^{o} …….

2-Age ☐ Sex ☐ Tribe:……..Language:…….Religion:……

3-Name of cell……

4-How many of you are in one cell? ----------

5-Have you heard about any ectoparasites before? Yes ☐ No ☐

6- Which parasites do you know? Name them ----------

7- How many times does the Doctor visit you or other inmates per week?----------

PERSONAL HYGIENE

1-How many times do you change your beddings per month? ----------

2-How many times do you clean your cell per week? ----------

3-Do you exchange dresses or combs with other inmates? Yes ☐ No ☐

4-How many times do you bathe? a) Per day---------- b) Per week----------

5-How often do you wash your dresses? ----------

6-Are they usually ironed before use? Yes ☐ No ☐

7-If no, why?----------

PHYSICAL EXAMINATION

1-Presence of lice a) Head lice ☐ b) Body lice ☐ c) Pubic lice ☐

2-Do you have scabies? Yes ☐ No ☐

3-Do you have jiggers? Yes ☐ No ☐

4-Do you have bedbugs? Yes ☐ No ☐

5 -Do you have rashes? Yes ☐ No ☐

6 -Do you have eczema? Yes ☐ No ☐

7 -Do you have ringworm? Yes ☐ No ☐