# Abstract

Background; A recent global review of pressure ulcers contained no studies from Africa.

Objective: To identify the prevalence and incidence of pressure ulcers in Africa.

Data sources: Bibliographic databases, African specific databases, grey literature.

Study eligibility criteria: Studies with prevalence or incidence data of pressure ulcers from Africa since the year 2000.

Participants: Any age, including children, in any setting, specifically including hospital patients from any clinical area but not restricted to hospital settings.

Study appraisal and synthesis methods: Hoy score for bias, Joanna Briggs Institute Critical Appraisal Instrument.

Method: We followed the PRISMA guideline for systematic reviews. We searched Embase, Medline, Scopus, CINHAL, Google Scholar, specialist African databases and grey literature for studies reporting incidence or prevalence data.

Results: Nineteen studies met the inclusion criteria and were included in the study. Point prevalence rates varied from 3.4% to 18.6% for medical/surgical and other general hospital units with a pooled prevalence of 11%, for grades II-IV 5%. For spinal injury units the pooled prevalence was 44%.

Limitations: restricted to English, French and Arabic.

Conclusion: Prevalence of pressure ulcers in Africa reported here is similar to figures from a recent review of prevalence in Europe and two recent global reviews of hospitalised patients. Prevalence of pressure ulcers in spinal cord injury patients is similar to figures from a review of developing countries. The reporting of prevalence is lacking in detail in some studies. Studies using an observational design employing physical examination of patients showed higher prevalence than those relying on other methods such as medical notes or databases.

Implications of key findings: Further prevalence and incidence studies are needed in Africa. Reporting of such studies should ensure items in the “Checklist for Prevalence Studies” from Joanna Briggs Institute (or similar well regarded resources) are addressed and the PICOS model and PRISMA guidelines are employed.

Systematic review registration number. Prospero registration number CRD42020180093

# Introduction

## Rationale

Pressure ulcers are common (we employ this term though some authors prefer pressure injury, we found no paper from Africa employing the term pressure injury). The prevalence has been reported in acute care [1], intensive care units [2-5], children [6], long term settings [7] and all care settings in selected northern European countries (hospitals, hospices, children, community and care homes) [8]. There is also a recent review of pressure ulcer prevalence in Europe [9] and two global reviews of hospital populations, one with a meta-analysis [10] and one without [11].

There is no review of prevalence and incidence studies of pressure ulcers in Africa, and no African studies are mentioned in the global reviews, indeed the lack of African studies is specifically noted [11] hence the need for this review.

## Objectives

1. To identify the prevalence and incidence of pressure ulcers (by grade if possible) in Africa.
2. To identify pressure ulcer classification and risk assessment scales used in Africa

# Methods

We followed guidance and instructions in the PRISMA statement (Preferred Reporting Items for Systematic reviews and Meta-Analyses) [12]. Our methods were informed by the chapter on systematic reviews of prevalence and incidence studies in the Joanna Briggs Institute Reviewer's Manual [13].

## Protocol and registration

We registered the protocol on Prospero ([www.crd.york.ac.uk/PROSPERO/](http://www.crd.york.ac.uk/PROSPERO/)) as advised by the PRISMA statement [12] with Prospero registration number CRD42020180093having previously searched on Prospero for other reviews on African pressure ulcer prevalence or incidence (there were none).

## Eligibility criteria

Following the PICOS model:-

**P**atient, **P**opulation, or **P**roblem: Any age, including children, in any setting, specifically including hospital patients from any clinical area but not restricted to hospital settings.

**I**ntervention, Prognostic Factor, or Exposure: Pressure ulcers prevalence or incidence - where available by grade.

**C**omparison or Intervention (if appropriate) Differences between various clinical areas or types of study

**O**utcome you would like to measure or achieve: Pooled estimate of pressure ulcer prevalence and incidence in Africa

What **T**ype of question are you asking?: Prevalence/incidence survey

Type of **S**tudy you want to find: Observational studies with physical examination of the skin (ideally), or studies with data obtained from medical records, databases and surveys.

Inclusion criteria: We limited papers considered to those based in Africa, published from 2000 and where a full paper was available. Papers in English, French or Arabic were considered. Papers in Spanish or Portuguese were considered for translation if they appeared relevant. Also if a paper appeared from its title to be relevant and had no abstract we would attempt to locate the full paper and include it if found to inform the review. We included studies where a physical examination of the subject had been conducted or if data were extracted from health records, databases, interviews or surveys but those from physical examination were separately analysed. In addition to general hospital patients we included specialist units such as spinal cord injury units. We included period prevalence as well as point prevalence and any incidence studies.

Exclusion criteria: Any study not meeting the inclusion criteria or that did not report prevalence or incidence data, or where the sample size was not given.

## Information sources

Our search strategy employed the methodology of the Peer Review of Electronic Search Strategies (PRESS) for systematic reviews [14]. Specifically two researchers were involved, a requester and reviewer, both of whom are experienced in searching bibliographic databases. The requester gave the search strategy to the reviewer. The reviewer reviewed the search strategy using the PRESS 2015 Guideline Evidence-Based Checklist (available as Table 1 in McGowana et al, 2016). The search strategy was then reviewed by the full team. Changes were made to the strategy including adding African specific databases. The databases used were medline (via OVID), embase (via OVID), Scopus, Global Health (via OVID), CINAHL (via EBSCO) and databases specific to Africa - African Journals Online, African Index Medicus and AfroLib. Additionally, reference lists in papers were examined for relevant papers. Papers were also searched for in Google Scholar and we explored the grey literature employing Dissertation Abstracts International; World Cat, Greylit.org, and OpenGrey.

Date last searched 22 May 2020.

## Search

We employed similar methods as used in an earlier prevalence review [7]. We used standard and specialist databases and employed variants of pressure ulcer plus prevalence or incidence and Africa and its countries. The full search is in Appendix 1 and documented in our entry in Prospero.

## Study selection

Abstracts of papers were read and where it appeared they might meet the inclusion criteria they were obtained in full text. One author selected the papers and a second checked the selection was appropriate. Similarly one author read and assessed the selected papers and removed any that did not meet the inclusion criteria and a second checked this final selection was appropriate.

## Data collection process

We used the Joanna Briggs Institute Data Extraction Form for Prevalence and Incidence Studies available in Munn et al [13].

## Data items

Data collected included paper citation and reference, setting (e.g. medical/surgical), study design, subject characteristics, ethical approval, prevalence (by grade where found), incidence (by grade where found), duration of study, sampling frame, definition of cases (e.g. by EPUAP or NPUAP grading systems [15]), risk assessment scales, anatomical sites of pressure ulcers and whether physical examination or other methods (e.g. medical records) were used to identify pressure ulcers.

## Risk of bias in individual studies

Selected papers were evaluated using the Joanna Briggs Institute Critical Appraisal Instrument for Studies Reporting Prevalence Data [13]. Assessment of bias is recommended by PRISMA [12] and studies were thus assessed for external and internal validity using a checklist devised by Hoy et al [16] as advised by Hahnel et al [17]. The Hoy score is marked out of ten and a value of 8-10 indicated low bias, 5-7 moderate bias and <=4 high bias.

We used the Hoy score as a measure of quality as it included items of particular interest to us such as whether an acceptable case definition is used and whether data were collected directly from subjects.

## Summary measures

Prevalence and incidence of pressure ulcers by grade (where available). Anatomical sites of pressure ulcers, risk assessment scales and ulcer grading systems.

## Synthesis of results

Papers’ results were pooled, where data were available, using a system designed for prevalence meta-analysis employing Excel spreadsheets - MetaXL [18]. MetaXL allows studies to be weighted by sample size and quality of study for which we used the Hoy score.

Given spinal cord injuries have a very different profile from the “systematically sick” [19] we decided to analyse studies concentrating on spinal cord injuries separately from other studies. Given some reviews exclude studies using medical records or other methods not employing assessment of skin we decided to analyse such studies separately.

## Risk of bias across studies

Assessment of publication bias is recommended by PRISMA [12]. We did consider meta-regression but as Martin Bland pointed out “These methods require large numbers of studies. They are not powerful in most meta-analyses” [20]. Similarly tests for publication bias are not very powerful, Bland quotes Begg and Mazumdar [21] who “say that their test is ‘fairly powerful with 75 studies, moderate power with 25 studies’. Even 25 studies is a pretty large meta-analysis”. Tests of publication bias, including Egger’s test, are low in power based on less than 20 trials [22]. Thus Egger’s test or meta-regression using a handful of studies is likely to give a type II error, so we have not attempted to test for publication bias as this could be misleading if it appeared to show no significant bias.

## Additional analyses

As above meta-regression was not indicated. Heterogeneity was measured using I2. Sensitivity analysis using the “leave out one” approach was conducted.

# Results

## Study selection

From an original search, 754 references were retrieved after removal of duplicates. 30 appeared to meet inclusion criteria following title/abstract screening of which nineteen were found to meet them in the full text screening, see Figure 1. Thirteen studies were of medical/surgical hospital populations, six were of spinal injury patients.

Thus we considered nineteen studies with 6,846 subjects. Of the studies with physical examination there were nine studies based on medical/surgical and/or general hospital patients which had a total of 3,459 subjects – one of these studies had data restricted to grade II-IV pressure ulcers and all other studies had data on all pressure ulcers (of which five studies had in addition data grades II-IV). Two further papers on the same patient category with 1,937 subjects used medical records to gain data. Six papers were of spinal cord injury patients with 1,450 subjects; of these only one paper employed physical examination of patients [23], see tables 1-2.

## Study characteristics

The majority of studies were of general hospital patients but several were of spinal cord injury patients. Some employed skin assessment, others medical records, and studies included cross sectional and cohort designs. See tables 1.

## Risk of bias within studies

See table 1 for the Hoy scores. The ranking of studies using the Joanna Briggs Institute Critical Appraisal Instrument score was very similar to the Hoy score.

## Results of individual studies

Forest plots are seen in Figures 1-3

## Synthesis of results

## Prevalence

Papers based on medical records or surveys showed a pooled prevalence of 4% (95% CI 3%, 5%) compared with 11% (95% CI 7%, 15%) for papers based on physical examination, see Figure 2. Excluding grade I ulcers gave a pooled prevalence of 5% (95% CI 2%, 9%), see Figure 3.

Spinal cord injury patients had a very high prevalence of 44% (95% CI 31%, 57%), see Figure 4. We excluded the sole paper based on physical examination [23] as this was not only different in its methodology but stated to be an incidence study, and that was even higher (56%), see Table 2.

### Incidence

The three studies explicitly giving incidence data cannot be combined in a meta-analysis as they are from such disparate patient groups. However in each case the incidence is high, and very high for the spinal cord injury paper, see Table 2.

### Risk assessment and grading scores

Some papers reported pressure ulcers without stating a grading system, others used NPUAP/EPUAP grading systems, one used the grading system employed in PUPS3 - which is consistent with NPUAP. None reported any unstageable ulcers or deep tissue injuries and only one study [24] mentioned either (unstageable, though they reported zero). Similarly data for hospital acquired pressure ulcers were only able to be extracted from one study so this also has not been reported. See table 3.

All six studies employing risk assessment tools used Braden though one study [25] also used Waterlow and Norton. See Table 3.

### Anatomical locations

Overwhelmingly the most common sites were the sacrum and trochanter, see Table 3.

## Risk of bias across studies

Table 1 gives Hoy scores for the studies. Those point prevalence studies employing skin assessment have low (n=6) or medium (n=3) risk of bias compared with two prevalence studies not using skin assessment that were medium and high risk. The spinal injury studies were low (n=1), medium (n=3) and high (n=1) risk of bias. The two incidence studies were high and medium risk of bias.

## Additional analysis

Heterogeneity was seen, even with the eight prevalence papers of general hospital patients for which skin assessment was made by physical examination on all grades of ulcers, with I2 =90%. Further subgroup analysis was not appropriate given the small sample size. The spinal injury studies also showed high heterogeneity with an I2=94%. Sensitivity analysis using the “leave out one” approach showed none of the studies was a prime determinant of ether pooled prevalence or heterogeneity.

# Discussion

## Summary of evidence

We conducted this review as no data on Africa were found in other reviews. There are reasons why these reviews found no studies as they may not have been in journals indexed by databases or the exclusion criteria of the review did not allow them to be considered. There is a lack of pressure ulcer prevalence studies in Nigeria [26]. Pressure ulcer data was said to be non-existent in a large Tunisian hospital [27] and prior to a study included here there were no data on pressure ulcers in the Democratic Republic of the Congo [28]. In our review for point prevalence of the general hospital population (the one most comparable with global reviews) the only countries with data were Ethiopia (n=6), Nigeria (n=2) and Tunisia (n=1) though there were two studies employing medical records on this patient group, one from Ethiopia and the other was Kenya. The two incidence studies were from Nigeria and Tunisia. The spinal cord injury studies were from Nigeria (n=4) and South Africa (n=2). Thus from a continent of 54 countries only five countries had any study of pressure ulcer prevalence or incidence.

We deliberately relaxed our inclusion and exclusion criteria to get at least an estimate of the prevalence in Africa. We believe we have an imperfect yet useful estimate of at least general hospital patients for a point prevalence of about 11%. The spinal injury subjects are predominantly male but these were not included in the Li at al global review which included only whole hospital (i.e. all or many departments of a hospital) samples. In general hospital patients the genders are roughly equal. In the global review of Li et al [10] mean age varied from 49 to 76. In our review it is difficult to directly compare as many studies gave age ranges rather than means, but for general hospital subjects the age ranged from the lowest, a median range of 18-32 [29] and a mean of 34 [30] to the highest, a mean of 52 [27] so unsurprisingly the African subjects are younger.

What is apparent is that there are studies in Africa that were missed in other reviews. Most studies we have located for this review would not be found from standard databases such as medline or CINAHL. Of the final nineteen included studies, three were from medline, four CINHAHL, one from Scopus (despite having the largest by far original records), but eight from Google scholar, two from reference lists of papers and one from internet searches. No included papers were located from any African Journals Online, African Index Medicus or AfroLib and only one reference was found (which was excluded as it was a conference abstract) from these specialist sources. From all sources we found only hospital based studies that fitted even our relaxed inclusion/exclusion criteria and it is possible there are no community based studies.

In papers where physical examination was employed it was never stated whether this was a head to toe examination of the patient and thus there remains some doubt as to whether some ulcers may have been missed. In some studies where a point prevalence was explicit or implicit it is clear whether prevalence or incidence was measured. But for studies using medical records it is less obvious even when the authors specifically state they are measuring prevalence or incidence. For example Joseph et al, who stated they were recording prevalence [31], entered newly injured patients (who may be assumed to have been ulcer free) and screened their patients weekly which implies an incidence study.

Spinal cord injuries show a very high prevalence in this review, though in the UK wheelchair users have shown a high point prevalence of 33% [32]. A review of pressure ulcers in spinal cord injury patients in developing nations stated such countries face particular problems such as fewer rehabilitation specialists and patients are often in remote areas. Data are scarce but from ten papers a mean prevalence of 35.2% [33] was found though differences in methods made any comparisons “challenging”. As an indication of how serious pressure ulcers are in this (often young) population, in a sample of 136 patients, at least 34 died within a year of discharge. The cause of death was not always known but of ten of those it was stated they died “mainly died from septicaemia due to pressure sores” [34].

In the European review [9] most studies included were observational and many employed EPUAP classification, though many did not specify a classification system – similar to our review. Moore et al also reported from mainly acute care hospitals. Thus while not exactly comparable, their prevalence (median 10.8%, mean 13.1%) and most common anatomical site (sacrum) based largely on acute hospital populations employing observational studies, were similar to our review. The patients in Africa are younger and thus prevalence should be lower if all other risk factors were similar – though with the resource limitations stated by some of the authors, for example in Nigeria [35], clearly this is not so.

We did consider excluding studies not employing physical examination of patients to confirm the existence of pressure ulcers as we believed those measuring prevalence or incidence (say from medical notes) would be less accurate than those using (say) a point prevalence approach and physical examination of patients. However we decided to include them but analyse them separately. We found that studies using medical records were reporting lower prevalences and this may be due to pressure ulcers being unreported. With only two such studies in this review this is not strongly supported. The studies of spinal cord injury patients, despite being (all bar one) retrospective studies of medical records, showed very high prevalence of pressure ulcers, which may yet be an under-estimate.

Where grades of pressure ulcers were reported there were few grade I ulcers seen in some studies, including observational studies, and as noted by one of the studies reported here [36], this may be due to difficulty in assessing dark toned skin for grade I ulcers.

# Limitations

We have limited papers to those written in English, French or Arabic. We found all relevant papers were written in English so this is unlikely to affect the results. We did not locate any papers in Spanish or Portuguese that were relevant. There were few studies located and for many countries in Africa there were none.

# Conclusion and recommendations

Further prevalence and incidence studies of pressure ulcers are needed in Africa. This is especially called for as the population increases in its elderly people and non-communicable diseases become more common. Such studies need to employ head to toe physical examination using a grading scheme such as EPUAP/NPUAP (as was done in several of the included studies). Prevalence studies should be point prevalence and incidence studies should clearly define the time period within which ulcers will be recorded. The population under study should be clearly defined. Figures should be given for each grade of ulcer to allow comparison with other studies. The use of PICOS and PRISMA guidelines is recommended. If future prevalence studies in Africa adopt all these recommendations they will be more likely to be published and easier to compare with studies in other continents.

# Conflict of interest

None.

# Ethical approval

None needed as this is a review of existing studies

# Funding

Reported in the title page but omitted here to preserve anonymity.

Table 1: Characteristics of included studies

| Author. year | Ref | Country | Clinical area | Design | Skin Assessment | Data collection | Hoy Risk of bias | JB score |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| (Adegoke et al., 2013) | [37] | Nigeria | Medical/  Surgical | Cross- sectional |  | Researcher | 8 | 8 |
| (Assefa et al., 2017) | [38] | Ethiopia | Medical/  Surgical/Maternity/ICU | Cross- sectional |  | Nurses trained by researchers | 8 | 8 |
| (Ben Mbarka et al.) | [27] | Tunisia | Medical/  Surgical | Cross- sectional |  | Nurse | 7 | 7 |
| (Dinkie Tadele et al., 2018) | [39] | Ethiopia | Medical/  Surgical/Orthopaedic/ Gynaecology | Cross- sectional |  | Nurses trained by researchers | 8 | 8 |
| (Ebrahim et al., 2018) | [40] | Ethiopia | Medical/  Surgical/ICU | Cross- sectional |  | Nurses trained by researchers | 8 | 8 |
| (Ezema et al., 2012) | [35] | Nigeria | Spinal cord injuries | Retrospective cohort | X | Chart review | 5 | 6 |
| (Frielingsdorf and Dunn, 2007) | [41] | South Africa | Spinal cord injuries | Retrospective cohort | X | Database, medical records | 5 | 6 |
| (Gedamu et al., 2014) | [29] | Ethiopia | Medical/  Surgical/Gynaecology | Cross- sectional |  | Nurses trained by researchers | 8 | 8 |
| (Ghali et al., 2018) | [25] | Tunisia | Medical/  Plastic surgery | Prospective cohort |  | Not stated | 6 | 5 |
| (Idowu et al., 2011) | [23] | Nigeria | Spinal cord injuries | Prospective cohort |  | Researcher | 8 | 7 |
| (Iyun et al., 2012) | [42] | Nigeria | Spinal cord injuries | Prospective cohort | X | Medical notes and interviews | 4 | 5 |
| (Joseph and Nilsson Wikmar, 2016) | [31] | South Africa | Spinal cord injuries | Prospective cohort | X | Weekly audit | 4 | 6 |
| (Kuruche et al., 2016) | [30] | Ethiopia | Medical/  Surgical/ICU | Cross- sectional |  | Nurses | 7 | 7 |
| (Ladan et al., 2014) | [43] | Nigeria | Medical/  Surgical/Orthopaedics/Neuro-surgical | Cross- sectional |  | Nurses | 7 | 7 |
| (Mengisitie et al.) | [24] | Ethiopia | Medical/  Surgical/ Gynaecology | Cross- sectional |  | Nurses trained by researchers | 9 | 8 |
| (Nangole et al., 2009) | [36] | Kenya | Medical/  Surgical | Prospective cohort | x | Medical records | 5 | 6 |
| (Obalum et al., 2009) | [44] | Nigeria | Spinal cord injuries | Retrospective cohort | X | Medical records | 5 | 6 |
| (Onigbinde et al., 2012) | [45] | Nigeria | Orthopaedic/spinal/ICU | Prospective cohort |  | Nurse or physiotherapist | 9 | 7 |
| (Valimungighe et al., 2018) | [28] | Democratic Republic of the Congo | Medical/  Surgical | Prospective cohort | x | Not stated | 3 | 5 |

Table 2: Findings of included studies

| Author, year | Sample size | Mean age (or age ranges) | Female % | Prevalence  All stages % | Prevalence excluding Grade I % | Incidence % |
| --- | --- | --- | --- | --- | --- | --- |
| (Adegoke et al., 2013) | 1211 | 47 | n/a |  | 3.2 |  |
| (Assefa et al., 2017) | 166 | Median range 35-46 | 58 | 9.6 | 9.0 |  |
| (Ben Mbarka et al.) | 473 | 52 | 47 | 5.3 |  |  |
| (Dinkie Tadele et al., 2018) | 355 | Median range 35-54 | 52 | 14.9 | 5.4 |  |
| (Ebrahim et al., 2018) | 228 | Median range 35-54 | 57 | 8.3 |  |  |
| (Ezema et al., 2012) | 568 | 37 | 11 | 51.9 |  |  |
| (Frielingsdorf and Dunn, 2007) | 101 | 35 | 17 | 21.8 |  |  |
| (Gedamu et al., 2014) | 422 | Median range 18-32 (50.2%, 48.8% older) | 49 | 16.8 | 6.4 |  |
| (Ghali et al., 2018) | 150 | 46 | 34 |  |  | 19.3 (16.7 excluding grade I) |
| (Idowu et al., 2011) | 105 | 36 | Not stated |  |  | 56.2 |
| (Iyun et al., 2012) | 67 | 38 | 24 | 67.2 |  |  |
| (Joseph and Nilsson Wikmar, 2016) | 141 | Median range 18-30 (54%, 46% older) | 14 | 29.8 |  |  |
| (Kuruche et al., 2016) | 239 | 34 | 47 | 13.4 | 10.9 |  |
| (Ladan et al., 2014) | 129 | Not stated | 8 | 18.6 | 17.1 |  |
| (Mengisitie et al.) | 236 | 39 | 40 | 3.4 | 2.1 |  |
| (Nangole et al., 2009) | 1175 | 38 | 32 | 4.2 |  |  |
| (Obalum et al., 2009) | 468 | Median range 31-40 | 30 | 34.8 |  |  |
| (Onigbinde et al., 2012) | 318 | 43 | 36 |  |  | 13.4 (1.3 excluding grade I) |
| (Valimungighe et al., 2018) | 762 | 46 | 42 | 4.3 |  |  |

Table 3: Pressure ulcer classification, risk assessment and anatomical sites

| Author/year | PU classification | Risk assessment tool | Site |
| --- | --- | --- | --- |
| (Adegoke et al., 2013) | PUPS3 (consistent with NPUAP [46]) | Not stated | Ischial tuberosity (44%) sacrum (18%) heel (8%) |
| (Assefa et al., 2017) | EPUAP | Braden | Sacral (44%) trochanter (25%) heel (13%) occiput (19%) |
| (Ben Mbarka et al.) | NPUAP | Braden | Sacrum (21%) trochanter (18%) most common |
| (Dinkie Tadele et al., 2018) | EPUAP | Braden | Sacrum (49%) heels (23%) |
| (Ebrahim et al., 2018) | EPUAP (probably, as stated used forms of [29]) | Braden | Sacral (53%) |
| (Ezema et al., 2012) | Not stated | Not stated | Sacrum (56%) feet/ankles (29%) |
| (Frielingsdorf and Dunn, 2007) | Not stated | Not stated | n/a |
| (Gedamu et al., 2014) | EPUAP | Not stated | Sacral (70%) |
| (Ghali et al., 2018) | NPUAP | Braden/Norton/Waterlow | Heel (15%) buttock (11%) sacrum (7%) trochanter (3%) |
| (Idowu et al., 2011) | EPUAP | Not stated | Sacrum (46%) trochanteric (36%) heels (15%) |
| (Iyun et al., 2012) | NPUAP | Not stated | Sacral (69%) trochanter (18%) |
| (Joseph and Nilsson Wikmar, 2016) | Not stated | Not stated | n/a |
| (Kuruche et al., 2016) | EPUAP | Not stated | Buttocks (56%) sacrum (38%) |
| (Ladan et al., 2014) | NPUAP | Not stated | Buttocks (50%) and sacrum (33%) |
| (Mengisitie et al.) | EPUAP | Braden | Sacrum |
| (Nangole et al., 2009) | Not stated | Not stated | Trochanter (43%) sacral (19%) ischial (10%) |
| (Obalum et al., 2009) | Not stated | Not stated | n/a |
| (Onigbinde et al., 2012) | EPUAP/NPUAP | Not stated | Sacrum, heels |
| (Valimungighe et al., 2018) | Not stated | Not stated | Gluteal (30%) sacral (27%) trochanter (18%) |

Figure 1 PRISMA flow diagram for study selection

Records identified through database searching

Global health 9 (all fields)

Embase 10 (all fields)

Medline 4 (all fields)

CINAHL 15 (all fields)

Scopus 700 (all fields)

## Identification

## Eligibility

## Included

## Screening

Records excluded   
(n = 724)

Based on title and/or abstract

Full-text articles excluded, with reasons   
(n =7, no prevalence or incidence data

n=3 only abstract

n=1 before 2000)

Full-text articles assessed for eligibility   
(n = 30)

Studies included in qualitative synthesis   
(n =19)

Studies included in quantitative synthesis (meta-analysis)  
(n =17)

Records after duplicates removed   
(n = 754)

Records screened   
(n =754 )

Additional records identified through other sources and African specific databases   
(n = 29)

Figure 2: Forest plot medical/surgical all grades split by physical examination or other methods



Figure 3: Forest plot medical/surgical grades II-IV



Figure 4: Forest plot spinal cord injury all grades



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# Appendix 1: Search strategy

For medline, embase, Scopus, Global Health and CINAHL

#1 (Preval\* OR incid\*)

#2 (pressure ulcer\*) OR (decubitus ulcer\*) OR (bedsore\*) OR (ulcere\* de pression) OR (plaie\* de pression) OR (úlcera\* por pressão OR úlcera\* por presión)

#3 (Algeria OR Angola OR Benin OR Botswana OR Burkina Faso OR Burundi OR Cabo Verde OR Cameroon OR Central African Republic OR Chad OR Comoros OR Congo, Democratic Republic of the OR Congo, Republic of the OR Cote d'Ivoire OR Djibouti OR Egypt OR Equatorial Guinea OR Eritrea OR Eswatini OR Ethiopia OR Gabon OR Gambia OR Ghana OR Guinea OR Guinea-Bissau OR Kenya OR Lesotho OR Liberia OR Libya OR Madagascar OR Malawi OR Mali OR Mauritania OR Mauritius OR Morocco OR Mozambique OR Namibia OR Niger OR Nigeria OR Rwanda OR Sao Tome and Principe OR Senegal OR Seychelles OR Sierra Leone OR Somalia OR South Africa OR South Sudan OR Sudan OR Tanzania OR Togo OR Tunisia OR Uganda OR Zambia OR Zimbabwe OR Algérie OR Bénin OR Cameroun OR République centrafricaine OR Tchad OR Côte d’ivoire OR Mauritanie OR Maroc OR Sénégal OR Tunisie OR Cabo Verde OR Guiné-Bissau OR Moçambique OR São Tomé Príncipe OR Guiné Equatorial OR República de Guinea Ecuatorial OR Africa OR Afrique OR Áfrico OR África)

#1 AND #2 AND #3

Searching on all text. N.B. for some databases we could not use the accents on letters.

For grey literature: Dissertation Abstracts International; World Cat, Greylit.org, and OpenGrey.

#5 (Prevalence)

#6 (pressure ulcer) OR (plaie de pression) OR (ulcere de pression) OR (úlcera por pressão) OR (úlcera por presión)

#7 Africa OR Afrique OR Áfrico OR África

#5 AND #6 AND #7

For African Journals Online, African Index Medicus, AfroLib

#5 AND #6

Searching on all text.

Google Scholar using Advanced method

Prevelance AND "pressure ulcer" AND each of the African countries in #3 separately

Prevelance AND pression AND (ulcere OR plaie) AND each of the Francophone African countries or those with official English and French language in #3 separately

Prevalência AND úlcera por pressão AND each of the Lusophone countries separately in their Portuguese spelling

Prevalencia AND úlceras por presión AND in its Spanish spelling República de Guinea Ecuatorial for the sole Spanish speaking country in Africa

Cochrane Library reviews searching for "pressure ulcers" and "prevalence" in any field.

All results were combined and duplicates removed.

N.B. we originally did not use the preferred term of some researchers of “pressure injury” in our original Prospero entry. In retrospect we should have done. However we checked using the search criteria above including “pressure injur\*” as done in Li et al [10] but no further studies were located.