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Health-related quality of life and its drivers in patients with chronic low back pain at a tertiary hospital in Cameroon; a cross-sectional study.

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ABSTRACT

Objective: To evaluate health-related quality of life (HRQoL) and its drivers in chronic low back pain (CLBP) patients in Cameroon.

Design: Observational cross-sectional study.

Setting: Tertiary hospital in Cameroon.

Participants: 150 consenting adults with low back pain (LBP) of at least twelve weeks were entered. 136 with complete questionnaires were analyzed.

Outcomes: HRQoL was measured with the World Health Organization Quality of Life questionnaire (brief version). Outcome measures included its 4 domain scores (physical health, psychological, social relationships and environmental domains) and 2 independent scores for overall quality of life (OQOL) and general health satisfaction (GH).

Results: 136 patients with median pain duration of 33 (Interquartile range: 69) months were included. The median OQOL score was 50 (Interquartile range: 25). In multivariable analysis, tertiary education (β= 11.43, 95% confidence interval (CI) = 3.12 to 19.75), age (β= 0.49, 95% CI= 0.12 to 0.87) and being a student (β= 23.07, 95% CI= 0.28 to 45.86) contributed to better OQOL. Age (β= 0.54, 95% CI= 0.07 to 1.01), disability (β= -1.07, 95% CI= -1.98 to -0.16) and physical-type employment (β= -15.14, 95% CI= -26.35 to -3.93) affected GH. Smoking (β= -20.49, p= 0.008, 95% CI= -35.49 to -5.48) and radiologic anomalies (β= -7.57, 95% CI= -14.64 to -0.49) affected the physical health domain, while disability (β= -0.67, 95% CI= -1.14 to -0.20) and duration of pain (β= -0.13, 95% CI= -0.20 to -0.05) affected the psychological

domain. Income (β= 14.94, 95% CI= 4.06 to 25.81) affected the social domain, while education (β= 9.96, 95% CI= 1.41 to 18.50) and disability (β= -0.75, 95% CI= -1.26 to -0.24) affected the environmental domain.

Conclusions: CLBP impairs HRQoL, and diverse socioeconomic/clinical factors influence its impact on different domains of HRQoL. Multipronged management programs, especially those that reduce disability could improve HRQoL in patients with CLBP.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- To our knowledge, this is the first study in Cameroon to explicitly investigate the impact of CLBP on HRQoL, and the determinants of the specific quality of life domains.
- We used a widely validated tool (WHOQOL-BREF) that allows for applicability across cultures and for comparisons between various settings.
- The absence of population norms for WHOQOL-BREF in Cameroon to serve as a reference limited our ability to establish relevant comparisons.
- We acknowledge that the cross-sectional design used in this study limits the establishment of causality in the associations identified.

INTRODUCTION

Low back pain (LBP) is an expanding health problem with a major impact on the general health and performance of populations worldwide. More than a third (38%) of the world's population suffer LBP in the course of a year [1, 2]. In 2017, LBP accounted for 850 Years Lived with Disability (YLD) per 100,000 population, and was the leading cause of disability globally [3]. In Africa, one in three adults on average have LBP. This was confirmed in a systematic review that reported a pooled adult prevalence of 32% and an average lifetime prevalence of 62% [4]. In Cameroon, LBP is the leading cause of rheumatologic consultation [5, 6]. It equally causes considerable disability [7] and was considered the leading cause of YLD in 2017, with 652 YLD per 100,000 populations, increasing by 2% since 2015 [3].

Pain, muscle tension or stiffness, localized below the costal margin and above the inferior gluteal folds, with or without leg pain (sciatica) [8] is referred to as *acute LBP* when it lasts less than six weeks, *sub-acute LBP* when it lasts six to twelve weeks, and *chronic LBP* when it lasts longer than twelve weeks [9]. Clinical and research emphasis is generally on chronic LBP because chronic pain is a recognized cause of reduced quality of life (QoL) [10].

QoL, a subjective concept, is defined in simple terms as a person's evaluation of his or her well-being and functioning in diverse domains of life [11]. The World Health Organization (WHO), defines QoL as an individual's perception of his or her position in life, in the context of the culture and value systems in which he or she lives, and in relation to his or her goals, expectations, standards, and concerns [12]. Health-related quality of life (HRQoL) though often used interchangeably with QoL [13], is considered by some as distinct or as a sub-concept of QoL [14, 15]. HRQoL pertains to an individual's evaluation of their experiences, and expectations in health-related aspects of their lives, notably; physical function, psychological well-being, subjective symptoms, social function and cognitive function [13, 14]. It is thought

to equally extend to the individuals perception of health correlates like health risks, social support, sociocultural beliefs, and economic status [16].

Most tools for measuring HRQoL are self-report questionnaires. The World Health Organization Quality of Life brief (WHOQOL-BREF) tool is a generic self-report HRQoL questionnaire (applicable to "healthy" and “sick” persons). It was developed using data from 15 countries including sub-Saharan African countries like Zambia and Zimbabwe. It is the brief version of the original one hundred item tool; WHOQOL-100. It is designed to be cross-culturally applicable and has been applied in clinical practice and research to measure health outcomes, monitor disease progress, and compare health states even across countries. In studies comparing generic HRQoL tools, WHOQOL-BREF was found to have good-to-excellent psychometric properties across disease states (especially in chronic disease) when compared with the most widely used of them all, the SF-36 [15, 17].

The HRQoL of patients with CLBP (largely in non-African settings), has been explored and found to be reduced or sub-optimal [18–20]. Besides the obvious pain, multiple factors are implicated in this reduced HRQoL, some of which include; disability, fear of movement, impaired sleep quality, depression, anxiety, low income, low educational levels, lumbosacral radiculopathy and overweight/obesity [21–26]. Amongst these, disability (impaired physical function) is considered a core issue. Disability results in considerable work absence, lower productivity and poorer HRQoL [27–29].

The effect of CLBP on HRQoL has hitherto, not been investigated in the Cameroonian patient. Evidence on the uniqueness of demographic, clinical and socioeconomic factors in low-resource sub-Saharan settings, and their influence on HRQoL in patients with CLBP is limited. In a bid to bridge this gap, we sought to assess HRQoL in Cameroonian CLBP patients using the WHOQOL-BREF tool. We investigated the prevalence of perceived poor QoL, the

prevalence of health dissatisfaction, and the drivers of various domains of HRQoL in these patients.

MATERIALS AND METHODS

Study design and setting

A cross-sectional study was conducted from January to March 2017 at the Douala General Hospital (DGH). The DGH is a tertiary hospital that receives patients from all ten regions of Cameroon. The study was carried out at the rheumatology unit that has three consultant rheumatologists, who (on alternate days) run the outpatient consultations of the unit. Douala is a major city in the Littoral region and is the economic capital of Cameroon, with an estimated population of 2.7 million [30].

Patient and Public Involvement Statement

This research did not involve patients or public in the initial study design. However, patient representatives were invited to test the acceptability of two popular HRQoL measuring tools (to determine which to use as principal outcome measure) for our population in terms of ease of understanding and time burden. Patients were again recruited to pretest the final questionnaire. Patients were not involved in the writing or editing of this document and were also not involved in the dissemination plans.

Sampling technique and study participants

Cochran formula for calculating sample size required to estimate a variable mean

($\mathbf{n = Z_{1-\alpha/2}^2 SD^2 / d^2}$) was used**.** We set the confidence level to 95%, adopted a 5-point difference in the OQOL as our absolute error or precision and a standard deviation of 24.2 in the OQOL derived from a similar study in LBP patients in Brazil in 2013 [27]. We obtained an estimated minimum sample size of 90 CLBP patients.

Consecutive sampling was used to recruit eligible and consenting adult patients aged 18 to 70 years. All patients presenting either de novo or for follow-up visits with complains of pain, muscle tension or stiffness, localized below the costal margin and above the inferior gluteal folds lasting no less than 12 weeks were considered. For clarity, the affected area of the body was shown in a human diagram. We excluded any patients who were pregnant, suspected to have cauda equina syndrome, or recent trauma. In addition, patients were excluded if they were unable to understand questions despite interviewer assistance. Figure 1 shows the flow diagram of participant selection leading to the final study sample.

Study procedures and data collection

Patients who fulfilled the study eligibility criteria and provided written informed consent were interviewed using a pre-tested structured questionnaire. Data collected were sociodemographic information, clinical data, as well as disability and quality of life assessment of participants. Questionnaires were available in English and French, the two official languages in Cameroon.

Sociodemographic characteristics:

Data on the following variables were collected; gender, age, marital status (single, married or widowed), employment status (employed, housewife, student, unemployed/retired), employment type (physical, non-physical), level of education (no education, primary, secondary and tertiary education), and average monthly income (< 50 000 FCFA, 50 000 - 100 000 FCFA, 100 000 - 300 000 FCFA, > 300 000 FCFA [1$US = 530FCFA]). Information on other characteristics like smoking status (current smoker, former smoker and non-smoker), alcohol use, and units of alcohol consumed per week (for consumers) were also obtained.

Clinical characteristics:

To clearly elucidate the duration of LBP, and cognizant of the remitting/recurring nature of LBP, the duration of pain was assessed in two ways. The total duration of LBP was recorded by asking participants the question; *"For how many years (months) have you had an ongoing low back pain problem?"*. This was adapted from the recommendations of the CLBP Research Task Force of the American National Institute of Health Pain Consortium [31]. Duration of their current pain episode was assessed by asking the question; *"How long (years/months) has it been since you went for a whole month without low back pain?"*, based on the definition of a LBP episode proposed by Vet et al. [32].

The assessment of pain intensity was done using the 100 mm visual analogue scale (VAS). Patients were asked to rate their pain level at the time of the interview. Other clinical data recorded included; leg pain, lower limb numbness/paresthesia (tingling, burning, electric-currents, numbness or "pins and needles" in the lower limbs), and bladder/bowel dysfunction symptoms (uncontrollable urges to urinate/stool, urine/stool leakages, or undue strain in stooling/initiating urine). In this study, we did not specifically identify the aetiology of these symptoms. In addition, the presence or absence of any comorbidity was documented. Patients' weight and height were measured and used to compute their body mass index (BMI). Seca® scales were used for weight measurement during which participants had to be without footwear and have on light clothing. For height measurement, the adult Leicester® stadiometer was placed against a wall, and participants (without shoes) stood upright while their heels and occiput were on the stadiometer. Measures were to the nearest 0.5 cm for height, and one decimal place for weight.

Assessment of disability:

The Roland Morris Disability Questionnaire (RMDQ), a subjective 24-item back pain-specific tool that assesses impairment in activities of daily living was used to assess disability. Responses to the 24 items were by either "yes" or "no", and a total score ranging from zero to 24 was generated by counting the number of "yes" responses (*yes* = 1 point and *no* = no point). Higher scores imply greater disability. The RMDQ is easily understood and available in validated English and French versions [33]. Work absence due to LBP was assessed in terms of *disability days,* which was defined as the number of days of restricted routine activity or work absence because of CLBP occurring within the 30 days preceding the interview.

Assessment of Health-Related Quality of Life (World Health Organization Quality of Life brief version– WHOQOL-BREF)

The WHOQOL-BREF tool consists of 26 items (questions/facets), 24 of which are divided into four domains: physical health domain (PHD), psychological domain (PSD), environmental domain (END), and social relationships domain (SRD). There are two separate items evaluating the individual's satisfaction with state of health (general health score) and individual's perception of quality of life (overall quality of life score). Scores are organized such that higher scores imply better HRQoL. PHD explores activities of daily living; dependence on medicines/medical aids, energy and fatigue, mobility, pain and discomfort, sleep and rest, and work capacity. PSD explores bodily image and appearance, negative feelings, positive feelings, self-esteem, spirituality/religion/personal beliefs, and thinking, learning, memory and concentration. SRD explores personal relationships, social support, and sexual activity. END explores financial resources, freedom, physical safety and security, accessibility and quality of health and social care, home environment, opportunities for acquiring new information and skills, participation in leisure activities, physical environment, pollution, noise, traffic and climate, and transport.

The WHOQOL-BREF questionnaire can be self-administered or interviewer-administered and responses are still valid allowing a 2-4 week period [34]. It was chosen due to its cross-cultural applicability, low administrative burden, sensitivity and responsiveness in chronic diseases states, and the availability of validated versions in Cameroon's national official languages (English and French). Each item of WHOQOL-BREF is scored on a 5-point likert scale. The item scores are then transformed into domain scores following the steps described in the WHOQOL-BREF manual [34]. While there are no established cut-off points for the WHOQOL-BREF domains to distinguish between "good" and "poor" HRQoL, two studies transformed the 2 individual items (general health score and overall quality of life score) into binary outcomes. In these studies, respondents with 2 points or less on a total of five (that is, rated their quality of life or health satisfaction as "poor" or "very poor"), were considered to have a poor outcome [20, 35].

Ethical considerations

Ethical approval to carry out the study was obtained from the University of Buea, Faculty of Health Sciences Institutional Review Board, with approval number: 2017/003/UB/SG/IRB/FHS. Written consent was obtained from all participants after careful explanation of the study scope and objectives. Strict anonymity and confidentiality were maintained during the handling of patient's records and response data. The study adhered to the World Medical Association's Declaration of Helsinki [36].

Data management and statistical analysis

Data were cleaned and analyzed using the Statistical Package for Social Sciences (SPSS Inc, Chicago, Illinois, USA) version 20. Continuous variables were tested for normality using the Shapiro-Wilk's test. For ease of comparison, we report both the means with standard deviations, and the medians with 25th and 75th percentiles for all variables. Categorical variables were

summarized using counts and percentages. The prevalence of poor overall quality of life (OQOL) and poor general health satisfaction (GHS) in CLBP was also estimated. Poor OQOL was considered as rating quality of life "poor" or "very poor" that is, cut-off scores of less than 3 points out of 5 of the original item score while moderate-to-good OQoL (≥ 3/5 points) for rating quality of life "neither poor nor good", "good" or "very good". Poor GHS (< 3/5 points), for rating satisfaction with health as "poor" or "very poor", and moderate-to-good GHS (≥ 3/5 points), patients rating satisfaction with health as "neither poor nor good", "good" or "very good".

GHS and OQOL scores were subsequently analyzed as continuous outcome variables. In bivariate analysis, Spearman's correlation coefficient was used to investigate associations of continuous independent variables with WHOQOL-BREF scores (PHD, PSD, END, SRD, GHS and OQOL scores). In cases where WHOQOL-BREF scores were normally distributed we used analysis of variance to explore differences in WHOQOL-BREF scores across categories, while for non- normally distributed data, we used the non-parametric Kruskal-Wallis test. Variables with a $p < 0.05$ in bivariate analysis were included in a multivariable model. Because residuals were approximately normally distributed, we used a multivariate linear regression models to determine factors independently associated with WHOQOL-BREF scores while adjusting for age, sex and other confounders. We checked for evidence of multicollinearity in the independent continuous variables via a correlation matrix and then ran collinearity diagnostics to assess their tolerance and variance inflation factor (VIF). All VIFs were less than two, suggesting absence of any multicollinearity. Statistical significance was set at $p < 0.05$.

RESULTS

One hundred and eighty potentially eligible patients CLBP patients (identified based on examination of patient's hospital records) were approached. They were screened via questioning to exclude pregnancy and trauma, and to confirm ability to understand questions.

One hundred and fifty who were confirmed eligible and provided consent, were included in study. However, only one hundred and thirty-six with complete WHOQOL-BREF questionnaires were included in the analysis (Figure 1). The median (25^{th} to 75^{th} percentile) age of participants was 52 (43 – 60) years, with a female: male ratio of 1.8:1. Detailed characteristics of our study participants can be found in Figure 2a and Figure 2b.

Pain and duration of CLBP

Overall, the median (25^{th} – 75^{th} percentile) duration of CLBP was 33 (12 - 78) months. The median duration of the ongoing pain episode was 12 (3 -24) months and the median perceived pain intensity score at the time of the interview was 40 (20 - 59) mm. Participants on average reported 6 ± 10 days of work loss in the previous month due to LBP (Table 1).

Health-related quality of life

All scores of the WHOQOL-BREF were not normally distributed with the exception of the END score. The median OQOL score of CLBP patients at DGH was 50.0 (50.0 -75.0). The general health satisfaction score was significantly worse (median 25 (0 – 50)) than the OQOL score ($p < 0.001$). Amongst the four domain scores, the highest score was in the psychological domain, median: 62.5 (47.9 – 70.8). The lowest was the environmental domain median: 53.1 (40.6 – 62.5), see Table 1 for more details. Overall, 7.4 % had a poor perceived OQoL, while 64.7% had poor GHS.

Factors influencing HRQoL domains

Physical Health Domain: In univariate analysis (Tables 1 and 2), the factors significantly related to poor PHD included; longer days of work absence, higher disability scores, higher reported pain intensity, current smoking, documented radiologic disease, and primary or no formal education versus tertiary level education.

Table 1: Correlation (spearman) between continuous variables and WHOQOL-BREF scores

	Mean ± SD	*Median*	*25th*	*75th*	*PHD*	*PSD*	*SRD*	*END*	*OQOL*	*GHS*
Age, years	50.6 ± 12.2	52.0	43.0	60.0	-0.14	-0.16˜	**-.24***	-0.11	0.07	0.01
Units of Alcohol per week	5.5 ± 11.7	0.8	0.0	6.5	0.11	-0.10	-0.14	-0.05	-0.07	0.00
Overall duration of CLBP, months	62.7 ± 85.5	33.0	12.0	78.0	-0.07	-0.04	-0.10	-0.02	0.11	0.05
Duration of pain episode, months	25.85 ± 45.2	12.0	3.0	24.0	-0.11	**-0.24****	-0.16	-0.13	0.04	0.01
BMI in kg/m²	29.6 ± 5.7	28.7	26.0	33.5	0.00	-0.13	-0.10	-0.08	0.05	-0.05
Days of work loss	6.0 ± 10.2	0.0	0.0	7.0	**-0.24****	-0.05	-0.10	-0.12	-0.12	-0.10
RMDQ	12.8 ± 6.1	13.0	7.0	18.0	**-0.34****	**-0.41****	**-0.26****	**-0.26****	-0.16˜	**-0.27****
Pain Intensity	41.3 ± 24.3	40.0	20.0	59.0	**-0.19***	**-0.34****	-0.11	-0.16˜	**-0.20***	**-0.26****
PHD Score	51.6 ± 10.5	53.6	44.6	57.1						
PSD Score	59.9 ± 15.7	62.5	47.9	70.8						
SRD Score	59.4 ± 20.5	58.3	50.0	75.0						
END Score	51.2 ± 16.0	53.1	40.6	62.5						
OQOL Score	59.6 ± 17.0	50.0	50.0	75.0						
GHS Score	31.4 ± 25.5	25.0	0.0	50.0						

** Correlation is significant at < 0.01 level (2-tailed).

* Correlation is significant at < 0.05 level (2-tailed).

˜ Correlations non-significant, at < 0.1 level (2-tailed).

Table 2: Univariate analysis, domain score differences across socio-demographic and clinical categories

	PHD				PSD				SRD				EN	
	Mean ± SD	*Median*	*25th*	*75th*	*F*	*Median*	*25th*	*75th*	*F*	*Median*	*25th*	*75th*	*F*	*Mean ± SD*	*F*
Gender					0.30				1.16				0.02		3.64˜
Male		53.6	42.9	57.1		66.7	47.9	75.0		66.7	50.0	75.0		54.6 ± 18.5	
Female		50.0	46.4	57.1		58.3	45.8	70.8		58.3	50.0	75.0		49.2 ± 14.3	
Marital Status					5.10 ˜				3.38				1.61		1.59
Married		53.6	46.4	57.1		62.5	45.8	70.8		58.3	50.0	75.0		50.8 ± 16.8	
Single		57.1	48.2	60.7		66.7	56.3	75.0		66.7	50.0	75.0		55.3 ± 13.4	
Widow		44.6	41.1	53.6		56.3	45.8	64.6		66.7	45.8	79.2		45.5 ± 15.2	
Level of Education					**7.54***				**6.65***				**8.99***		**9.13****
Primary /no formal		**50.0** [a]	42.9	57.1		**58.3**	45.8	70.8		**50.0** [a]	33.3	66.7		**43.4 ± 14.4**[a]	
Secondary		**51.8**	42.9	57.1		**58.3** [a]	41.7	70.8		**58.3**	41.7	75.0		**50.3 ± 16.7**	
Tertiary		**57.1** [b]	46.4	60.7		**66.7** [b]	54.2	75.0		**66.7** [b]	58.3	75.0		**57.8 ± 13.7**[b]	
Employment status					4.95				8.70 ˜				5.66		0.98
Unemployed		50.0	42.9	57.1		56.3	45.8	62.5		54.2	33.3	58.3		44.4 ± 15.2	
Employed		53.6	46.4	60.7		66.7	50.0	75.0		66.7	50.0	75.0		52.1 ± 16.6	
Student		57.1	50.0	64.3		58.3	54.2	70.8		58.3	33.3	75.0		52.1 ± 11.0	
Housewife		50.0	46.4	57.1		58.3	50.0	62.5		58.3	41.7	66.7		48.3 ± 13.3	
Retired		42.9	39.3	57.1		50.0	37.5	62.5		66.7	50.0	75.0		55.6 ± 16.7	
Employment type					1.08				0.91				3.66		0.45
Physical	50.3 ± 11.2		42.9	57.1		66.7	41.7	75.0		50.0	33.3	75.0		52.9 ± 17.7	
Non-physical	53.6 ± 10.1		46.4	60.7		62.5	50.0	75.0		66.7	58.3	75.0		52.3 ± 15.7	
Combination	50.0 ± 10.1		42.9	57.1		75.0	54.2	81.3		54.2	33.3	75.0		44.5 ± 25.6	
Income (thousand FCFA)					3.28				6.91 ˜				**11.76****		**3.33***
< 50		50.0	42.9	57.1		58.3	50.0	66.7		**58.3** [a]	33.3	79.8		**48.0 ± 14.5**[a]	
50 – 100		53.6	46.4	57.1		56.7	40.0	70.8		**66.7**	50.0	75.0		**46.4 ± 13.7**	
100 – 300		57.1	46.4	60.7		66.7	47.9	75.0		**66.7**	58.3	77.2		**54.5 ± 11.5**	
> 300		53.6	46.4	60.7		66.7	54.2	75.0		**66.7** [b]	50.0	75.0		**57.1 ± 20.6**[b]	

Alcohol Consumption				1.23				1.20			0.46		0.02
Non-consumer		53.6	41.7	57.1		58.3	45.8	66.7		66.7	33.3	83.3		51.6 ± 19.1	
Consumer		53.6	46.4	57.1		62.5	50.0	75.0		58.3	50.0	75.0		51.1 ± 15.3	
Smoking				**4.53***				2.42			0.70		1.67
Non-smoker	**51.4 ± 10.3[a]**		44.6	57.1		62.5	47.9	70.8		62.5	50.0	75.0		50.6 ± 15.1	
Former	**54.6 ± 9.5[a]**		50.0	60.7		66.7	54.2	75.0		58.3	41.7	66.7		56.1 ± 18.3	
Current	**35.7 ± 14.3[b]**		21.4	50.0		58.3	37.5	62.5		50.0	16.7	83.3		41.2 ± 30.8	
Numbness or paraesthesia				0.74				2.91 ˜			1.80		3.12 ˜
Absent		53.6	46.4	57.1		66.7	54.2	75.0		66.7	50.0	75.0		53.7 ± 15.5	
Present		50.0	42.9	57.1		58.3	45.8	70.8		58.3	41.7	66.7		48.8 ± 16.3	
Sphincter dysfunction				3.20 ˜				3.18 ˜			**5.22***		**5.74***
Absent		53.6		60.7		62.5	54.2	75.0		**66.7**	50.0	75.0		**53.5 ± 14.8**	
Present		50.0		57.1		58.3	41.7	70.8		**58.3**	33.3	75.0		**46.7 ± 17.4**	
Leg pain				1.01				0.09			0.02		0.00
Absent	52.6 ± 9.5		46.4	60.7		62.5	50.0	75.0		66.7	50.0	75.0		51.2 ± 15.8	
Present	50.8 ± 11.2		42.9	57.1		62.5	45.8	70.8		58.3	41.7	75.0		51.3 ± 16.3	
Receiving treatment				0.11				0.23			2.42		0.07
No		51.8	50.0	57.1		62.5	45.8	70.8		66.7	50.0	75.0		52.1 ± 11.3	
Yes		53.6	42.9	57.1		62.5	50.0	75.0		58.3	41.7	75.0		51.1 ± 17.0	
Comorbidity				0.02				0.02			0.60		0.07
Absent		53.6	42.9	57.1		58.3	50.0	70.8		66.7	50.0	75.0		49.0 ± 15.6	
Present		50.0	46.4	57.1		62.5	45.8	75.0		58.3	50.0	66.7		53.1 ± 16.5	
Radiologic lesions				**4.42***				0.20			**4.16***		2.76
Present		**53.6**	57.1	60.7		60.4	55.0	75.0		**58.3**	66.7	75.0		49.2 ± 16.3	
Absent/ not requested		**57.1**	42.9	60.7		62.5	45.8	70.8		**75.0**	41.7	75.0		58.8 ± 18.8	

SD = Standard deviation

** Mean or median differences significant at <0.01 level.

* Mean or median differences significant at <0.05 level.

˜ Mean or median differences non-significant, at < 0.1 level.

[a-b] Mean or medians in categories with unidentical superscript letters differ ($P < 0.05$), following post-hoc analysis.

In multivariate analysis, factors that independently influenced HRQoL in the physical domain included; current smoking (β = -20.49, p = 0.008), and documented radiologic disease (β = -7.57, p=0.036). The model explained 22.6% of the variance in the PHD scores (Table 3).

Psychological Domain: In the univariate analysis, factors associated with poorer HRQoL in the psychological domain were; the duration of a pain episode, higher RMDQ, and secondary education when compared to tertiary education (reference category) (Table 1 and Table 2).

However only the RMDQ score (β = -0.67, p = 0.006) and the LBP episode (β = -0.13, p = 0.001) significantly influenced the PSD in multivariate analysis. The model explained 26.1% of the variance in the PSD score (Table 3).

Social Relationships Domain: Lower SRD scores were associated with older age, sphincter dysfunction, documented radiologic lesions, primary education versus tertiary and an income below 50,000 FCFA versus one above 300 000 FCFA (Table 1 and Table 2).

In the multivariate model, the only independent predictor of SRD was income. Monthly incomes of 50 000 FCFA to 100 000 FCFA (β = 12.42, p = 0.044) and 100 000 FCFA to 300 000 FCFA (β = 14.94, p = 0.008) were associated with better SRD scores when compared with income below 50 000 FCFA. The model explained 13.4% of the variance in SRD scores (Table 3).

Environmental Domain: Univariate analysis revealed that lower END scores were associated with higher RMDQ scores, primary versus tertiary education, an income below 50,000 FCFA versus one above 300 000, and sphincter dysfunction (Table 1 and Table 2).

Factors independently associated with higher END scores were; tertiary level education (β = 9.96, p = 0.023) and RMDQ score (β = -0.75, p = 0.004). The model explained 15.4% of the variance in END scores (Table 3).

Table 3: Multivariate regression model showing factors independently associated with WHOQOL-BREF scores.

		PHD *aR² = 0.226*		*PSD* *aR² = 0.261*		*SRD* *aR² = 0.134*		*END* *aR² = 0.154*		*OQOL* *aR² = 0.129*		*GHS* *aR² = 0.187*	
		β	**95% CI**	**B**	**95% CI**	**β**	**95% CI**	**β**	**95% CI**	**β**	**95% CI**	**β**	**95% CI**
Gender	Male			1		1		1		1		1	
	Female	1.29	-3.41, 5.99	0.14	-6.14, 6.42	5.59	-3.59, 14.78	0.21	-6.42, 6.84	2.01	-4.89, 8.90	1.17	-8.56, 11.00
Marital Status	Married	1											
	Single	1.72	-4.45, 7.89										
	Widow	-6.40	-14.0, 1.20										
Level of Education	Primary/no formal	1		1		1		1		1			
	Secondary	-0.53	-5.68, 4.62	-5.71	-12.54, 1.13	0.93	-9.24, 11.11	4.80	-2.63, 12.22	5.39	-2.64, 13.41		
	Tertiary	-0.27	-5.71, 5.18	1.32	-6.64, 9.29	5.61	-5.63, 16.86	**9.96***	**1.41, 18.51**	**11.43****	**3.12, 19.75**		
Employment status	Unemployed			1						1			
	Employed			2.47	-7.50, 12.45					8.57	-1.28, 18.42		
	Student			7.63	-12.31, 27.57					**23.07***	**0.28, 45.86**		
	Housewife			4.56	-6.68, 15.79					14.87	-0.22, 29.96		
	Retired			-3.92	-17.28, 9.44					10.15	-5.35, 25.65		
Employment Type	Non-physical											1	
	Physical											**-15.14****	**-26.35, -3.93**
	Combination											12.26	-11.57, 36.08
Income (thousand FCFA)	< 50			1		1		1					
	50-100			-2.17	-11.17, 6.84	**12.42***	**0.36, 24.49**	-2.09	-10.61, 6.43				
	100-300			0.88	-8.21, 9.96	**14.94***	**4.06, 25.81**	3.13	-5.04, 11.30				
	>300			4.10	-5.47, 13.66	9.26	-2.82, 21.35	5.63	-3.12, 14.38				
Smoking	Non-smoker	1											
	Former	5.92	-0.02, 11.87										
	Current	**-20.49****	**-35.49, -5.48**										

Numbness/ Paraesthesia	Absent			1				1		1			
	Present			-2.06	-7.39, 3.28			-3.76	-9.50, 1.97	-6.22	-12.71, 0.26		
Sphincter Dysfunction	Absent	1		1		1		1					
	Present	-2.43	-6.75, 1.89	-1.44	-7.18, 4.30	-4.90	-12.98, 3.17	-3.01	-9.08, 3.06				
Comorbidity	Absent									1			
	Present									1.75	-5.14, 8.63		
Radiological Lesion	Absent/ not requested	1				1							
	Present	**-7.57***	**-14.64, -0.49**			-8.27	-21.76, 5.21			-10.52	-21.45, 0.41		
Age, years		0.02	-0.18, 0.22	0.03	-0.24, 0.30	0.05	-0.31, 0.41	0.15	-0.11, 0.41	**0.49***	**0.12, 0.87**	**0.54***	**0.07, 1.01**
Duration of pain Episode				**-0.13****	**-0.20, -0.05**	0.04	-0.06, 0.14						
Work loss, days		-0.14	-0.35, 0.07										
RMDQ score		-0.25	-0.67, 0.16	**-0.67****	**-1.14, -0.20**	-0.59	-1.22, 0.05	**-0.75****	**-1.26, -0.24**	-0.45	-1.06, 0.16	**-1.07***	**-1.98, -0.16**
Pain intensity		-0.06	-0.17-0.04	-0.08	-0.20, 0.04			0.09	-0.05, 0.23	-0.01	-0.17, 0.14	-0.19	-0.43, 0.05

β = beta coefficient, CI = confidence interval

*** Beta coefficient significant at < 0.001 level.

** Beta coefficient significant at < 0.01 level.

* Beta coefficient significant at < 0.05 level.

Overall Quality of Life and General Health Satisfaction: Higher perceived pain intensity was significantly associated with lower GHS and OQOL scores. Disability negatively influenced GHS but not OQOL. OQOL differed significantly in those with limb numbness/paraesthesia while the GHS score was significantly lower in those employed in physical effort requiring jobs compared to those who were not (Table 1 and Table 4).

In the multivariate analysis, tertiary education ($\beta = 11.43$, $p = 0.008$), increasing age ($\beta = 0.49$, $p = 0.010$) and being a student ($\beta = 23.07$, $p = 0.047$) were independently associated with OQOL. The model explained 12.9% of the variance in the OQOL score. Amongst the domain scores, higher SRD scores ($\beta = 0.19$, $p = 0.005$) and END scores ($\beta = 0.47$, $p < 0.001$) were associated with better OQOL (Table 5).

Following multivariate analysis, variables independently associated with GHS were; age ($\beta = 0.54$, $p = 0.024$), RMDQ score ($\beta = -1.07$, $p = 0.022$) and physical-type employment ($\beta = -15.14$, $p = 0.009$), with the model explaining 18.7% of the variance in GHS scores. No domain score was significantly related to the GHS score (Table 5).

Table 4: Univariate analysis, OQOL and GHS score differences across sociodemographic and clinical categories

	OQOL				*GHS*			
	Median	***25th***	***75th***	***F***	***Median***	***25th***	***75th***	***F***
Gender				0.11				0.31
Male	50.0	50.0	75.0		25.0	25.0	50.0	
Female	50.0	50.0	75.0		25.0	0.0	50.0	
Marital Status				2.40				1.73
Married	50.0	50.0	75.0		25.0	0.0	50.0	
Single	50.0	50.0	75.0		25.0	25.0	50.0	
Widow	75.0	50.0	75.0		25.0	12.5	25.0	
Level of Education				5.11 ˜				2.08
Primary/ no formal	50.0	50.0	75.0		25.0	0.0	50.0	
Secondary	50.0	50.0	75.0		25.0	25.0	50.0	
Tertiary	75.0	50.0	75.0		25.0	25.0	50.0	
Employment status				9.19 ˜				5.21
Unemployed	50.0	50.0	50.0		25.0	0.0	50.0	
Employed	50.0	50.0	75.0			25.0	50.0	
Student	50.0	50.0	75.0		25.0	0.0	50.0	
Housewife	50.0	50.0	75.0		50.0	0.0	25.0	
Retired	75.0	50.0	75.0		0.0	25.0	50.0	
Employment type				0.04				**6.34***
Physical	50.0	50.0	75.0		**25.0** [a]	0.0	25.0	
Non-physical	50.0	50.0	75.0		**50.0** [b]	25.0	50.0	
Combination	75.0	25.0	75.0		**25.0**	12.5	75.0	
Income (thousand FCFA)				5.79				1.37
< 50	50.0	50.0	75.0		25.0	0.0	50.0	
50 – 100	50.0	50.0	75.0		25.0	25.0	50.0	
100 – 300	75.0	50.0	75.0		25.0	0.0	75.0	
>300	62.5	50.0	75.0		25.0	25.0	50.0	
Alcohol use				2.03				0.46
Non-consumer	75.0	50.0	75.0		25.0	0.0	75.0	
Consumer	50.0	50.0	75.0		25.0	0.0	50.0	
Smoking				0.38				0.15
Non-smoker	50.0	50.0	75.0		25.0	0.0	50.0	
Former	50.0	50.0	75.0		25.0	25.0	50.0	
Current	50.0	50.0	75.0		25.0	0.0	50.0	
Numbness or paraesthesia				**4.69***				1.71
Absent	**50.0**	50.0	75.0		25.0	25.0	50.0	
Present	**50.0**	50.0	75.0		25.0	0.0	50.0	
Sphincter dysfunction				2.63				3.51
Absent	50.0	50.0	75.0		25.0	25.0	50.0	
Present	50.0	50.0	75.0		25.0	0.0	50.0	
Leg pain				0.14				1.00
Absent	50.0	50.0	75.0		25.0	25.0	50.0	
Present	50.0	50.0	75.0		25.0	0.0	50.0	
Receiving treatment				0.07				1.40
No	50.0	50.0	75.0		37.5	25.0	50.0	
Yes	50.0	50.0	75.0		25.0	0.0	50.0	
Comorbidity				3.82 ˜				0.78
Absent	50.0	50.0	75.0		25.0	0.0	50.0	
Present	50.0	50.0	75.0		25.0	25.0	50.0	
Radiologic lesions				3.74 ˜				0.77
Present	75.0	50.0	75.0		25.0	0.0	25.0	
Absent/ not requested	50.0	50.0	75.0		25.0	25.0	50.0	

** Mean or median differences significant at <0.01 level.

* Mean or median differences significant at <0.05 level.

˜ Mean or median differences non-significant, at < 0.1 level.

[a-b] Mean or medians in categories with unidentical superscript letters differ ($P < 0.05$), following post-hoc analysis.

Table 5: Multivariate regression model showing the influence of various domains on OQOL and GHS scores.

	OQOL		***GHS***	
	aR² = 0.317		***aR² = 0.055***	
	B	**95% CI**	**B**	**95% CI**
Physical domain	-0.20	-0.46, 0.07	0.32	-0.16, 0.79
Psychological domain	0.10	-0.08, 0.28	0.26	-0.06, 0.58
Social domain	**0.19****	**0.06, 0.33**	0.05	-0.18, 0.28
Environmental domain	**0.47*****	**0.27, 0.66**	0.07	-0.27, 0.41

β = beta coefficient, CI = confidence interval

*** Beta coefficient significant at < 0.001 level.

** Beta coefficient significant at < 0.01 level.

* Beta coefficient significant at < 0.05 level.

DISCUSSION

Chronic pain is a recognized cause of reduced quality of life, but the dimensions and extent of its impact on HRQoL are subject to variations based on disease type, setting and even the individual. The aim of this study was therefore to describe HRQoL and its drivers in CLBP patients in Cameroon. We found that slightly less than a tenth of our study participants reported a poor overall quality of life, while more than two-thirds were dissatisfied with their general health. Determinants of HRQoL varied according to WHOQOL-BREF component domains. Being a current smoker and having radiologic disease predicted poorer physical health, while higher RMDQ scores (increased disability) and LBP episodes predicted poorer psychological health. Having higher incomes, predicted better social relationships while higher level of education and less disability (lower RMDQ scores) predicted better environmental health domain. Higher (tertiary) education, increasing age and being a student predicted better OQOL while increasing age, less disability (lower RMDQ scores) and not having physical-type employment were independently associated with better general health satisfaction.

This study had certain limitations. Using a cross-sectional study design limited our ability to determine causality, as would have been possible with a prospective cohort design. In addition, our study was prone to selection bias owing to the use of a non-random sampling technique and the selected nature (hospital-based) of the study. Our findings cannot be generalized without caution as they likely reflect the situation at the study facility. Furthermore, we did not explicitly assess the aetiology of associated symptoms. We acknowledge that they may have been due to other health problems and not necessarily LBP. Finally, there is no culturally adapted, validated, generic HRQoL questionnaire specific for Cameroon. Also, there are no population norms for WHOQOL-BREF in Cameroon. This lack of a reference limits our possibility to analyze health outcomes. However, we sought to reduce some of the bias by choosing a widely validated tool

specially developed to be applied across cultures and permit comparisons across various settings.

The average (and median) OQOL score for CLBP patients in our study was about half of the maximum score; similar to findings reported in other CLBP populations [27, 37, 38]. In studies with a mixed population of acute and chronic LBP patients, higher mean scores have been reported [18, 19], supporting the idea that chronic pain has a stronger impact on quality of life than acute pain [10]. The average health satisfaction score was significantly lower than the average overall quality of life score as has been previously reported [39]. In fact, health dissatisfaction was a lot more common (64.7% compared to 7.4% who rated their quality of life as poor) despite the fact that our patients were recruited within a health facility, presumably receiving some form of care. In an Austrian study [20] health dissatisfaction was less common than in ours, only about a quarter of persons with CLBP were found to be dissatisfied with their health. This was perhaps due to better health access in this population or the fact that participants were recruited from the community. In the same study, the proportion of patients who rated their QoL as "very bad" or "bad" (8.6% in men and 14.7% in women) was comparable to our findings. This disparity in health satisfaction versus self-assessed QoL points to the fact that while pain influences perceived health status, the effect on quality of life is by no means a direct one. HRQoL is broader than one's state of health and has multiple determinants.

The environmental domain was the only variable normally distributed in our patients as was also reported in other back pain patients [18]. The END score was equally the most impaired HRQoL domain in our patients and this too has been previously reported in a Brazilian CLBP cohort [37]. However, the physical domain which was scored slightly better than the END by our patients has been more commonly identified as most affected in similar patient groups elsewhere [18, 20, 27, 38, 40]. When consideration is given to the items assessed in the END

score (satisfaction with finances, physical security, accessibility of health care, quality of health/social care, home environment, participation in leisure activities, pollution, noise, traffic and transport), it appears likely that the low scores found in our patients may reflect the general low standards of living in our population, and limited infrastructure adapted for persons with disability.

The highest scored (least impaired) domains of HRQoL were the psychological and the social domains. A few studies reported opposite findings; PSD scores were the lowest (most impaired) in their CLBP patients [19, 39]. Some other LBP patient groups showed greater similarity to our group in that, the SRD domain was the highest scored [18–20, 27, 37–40] (second place to the PSD in our study). Amongst the four domains, environmental quality of life and social quality of life predicted patients' perception of their overall quality of life. A previous study rather discovered a relationship between OQOL and the physical and psychological domain scores [19]. These findings illustrate how factors unique to each population setting could influence HRQoL in identical disease states.

Several sociodemographic and clinical characteristics differentially influenced various HRQoL domains of study participants. Beginning with sex, there was no difference in HRQoL domain scores between males and females CLBP patients in our study, and in some others [18, 27]. One study however, reported better PSD scores in males with CLBP compared to females [40]. Age as well did not affect any of the HRQoL domains in our patients, but findings in previous literature have thus far been variable. For example, in Brazil older CLBP patients had poorer scores in all four domains [27], in Bosnia, older patients had poorer PSD and PHD scores [40], while findings in Poland reflected ours [38]. Interestingly, however, we found that older age independently predicted better health satisfaction and higher OQOL.

Disability emerged as a key factor in our study as previously established [19, 27, 39]. Disability negatively correlated with all WHOQOL-BREF domains. It was equally related to lower health

satisfaction in our patients, but did not significantly influence perception of overall quality of life as has reported elsewhere [19, 39]. In addition, disability in our group related most strongly not with the PHD as had been reported [19, 27, 39], but with the PSD score. Pain intensity appeared be a weaker contributor to HRQoL when compared with disability in our cohort of patients. It correlated with the PHD, PSD as well as OQOL and GH in univariate analysis which reflects findings in previous research [19, 38], however these relationships were not significant after controlling for confounders.

When examining the physical domain, (in addition to disability and pain intensity) longer work absence was associated with lower PHD scores in bivariate analysis. However, after controlling for age, sex, and other variables, being a current smoker and having documented radiologic lesions were the only factors independently associated with lower PHD. Smoking has been previously explored in Brazilian CLBP patients, but found to have no influence on PHD [27].

Besides the strong relationship between disability and psychological quality of life, persons with a longer duration of back pain also had poorer PSD scores. Duration however did not influence any other HRQoL score. In a Polish cohort, duration of LBP rather influenced the END score [38].

Tertiary education predicted better environmental quality of life while higher income predicted better social quality of life. Our results did not conform to previous reports [27, 38]; in these patients, educational level and income did not significantly influence any of the HRQoL scores after controlling for confounders.

Education equally seemed to play a role in perceived OQOL. Students and persons with university-level education had higher scores. Examining employment, a little more detailly revealed that work type seems to influence health satisfaction in LBP patients and logically so. Subjects whose professional occupations involved physical exertion had significantly lower health satisfaction.

Future research to develop a culturally adapted generic HRQoL tool for our setting and establish population norms of existing tools could go a long way to improving evaluation of the impact of CLBP on HRQoL.

Conclusions

Our results demonstrate that CLBP impairs HRQoL of affected patients. Factors influencing the HRQoL in CLBP patients vary according to the various component domains. Multi-component management strategies, especially those that reduce disability should be considered to improve HRQoL in patients with CLBP. To the best of our knowledge, this study is the first of its kind in Cameroon to provide evidence on the health-related quality of life of patients with chronic low back pain, as well as the determinants of quality of life in this population. Our findings are thus relevant for health policy makers, as not only does it inform them to what extent CLBP affects quality of life but has also unearthed significant drivers that could be targeted in order to mitigate the burden of CLBP.

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Competing interests' statement

None declared.

Authors contributions

Study conception and design: JAA, LNA, MDB. Data collection: JAA, MDB, FKL, FMK. Statistical analysis: JAA and LNA. Drafting of manuscript: JAA and LNA. Critical review of manuscript: LNA, MDB, JAA, AMC, EVY.

ABBREVIATIONS

LBP	Low back pain
CLBP	Chronic low back pain
YLD	Years lived with disability
QoL	Quality of life
HRQoL	Health-related quality of life
WHO	World Health Organization
WHOQOL-BREF	World Health Organization Quality of Life Brief
DGH	Douala General Hospital
VAS	Visual analogue scale
BMI	Body mass index
RMDQ	Roland Morris Disability Questionnaire
PHD	Physical health domain
PSD	Psychological domain
END	Environmental domain
SRD	Social relationships domain
OQOL	Overall quality of life
GHS	General health satisfaction
SPSS	Statistical Package for Social Sciences
VIF	Variance inflation factor
IQR	Interquartile range
SD	Standard deviation
CI	Confidence interval

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FIGURE LEGENDS

Figure 1: Derivation of final study population.

180 CLBP patients approached consecutively. 136 eligible consenting patients with completed questionnaires retained for the study.

Figure 2: Description of the general characteristics of the study participants.

2a: Socio-demographic characteristics (N=136). 2b: Clinical characteristics (N=136).

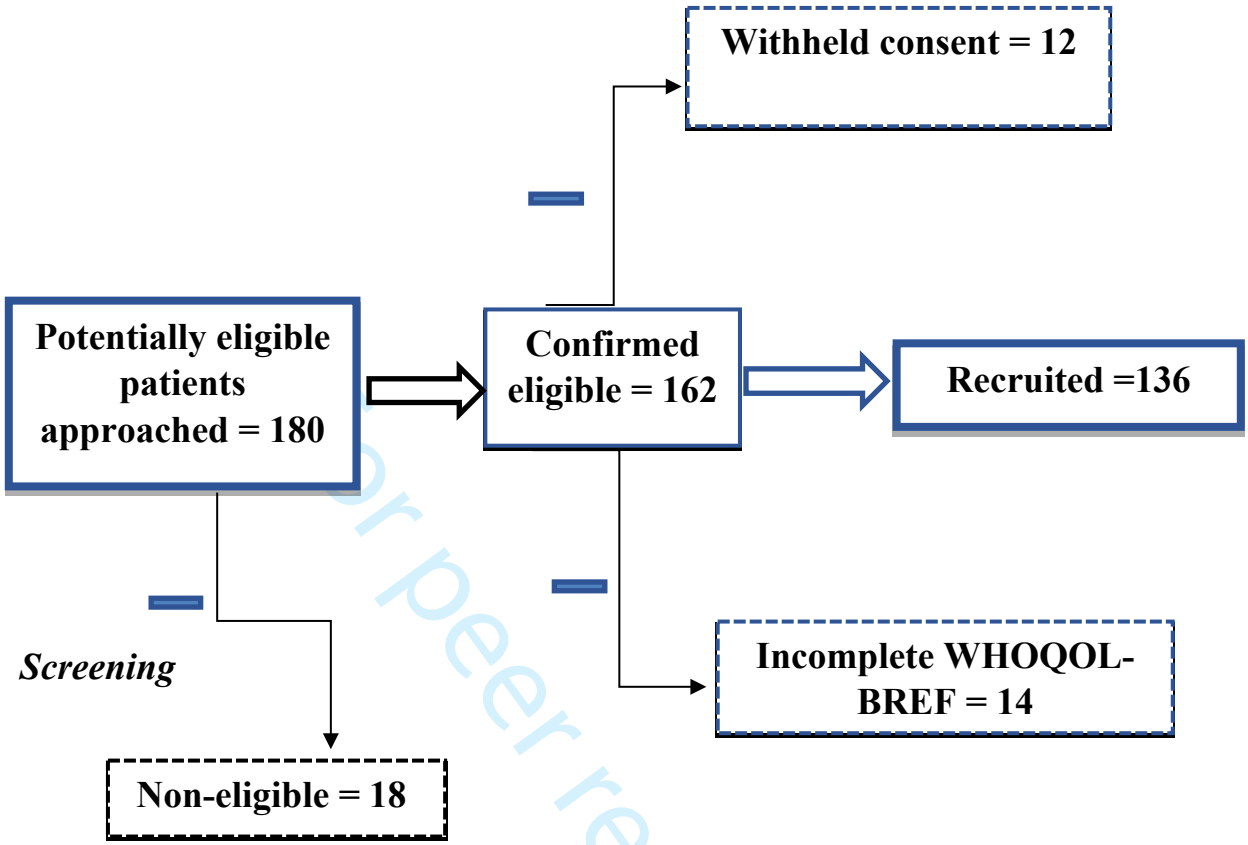

Figure 1: Derivation of final study population

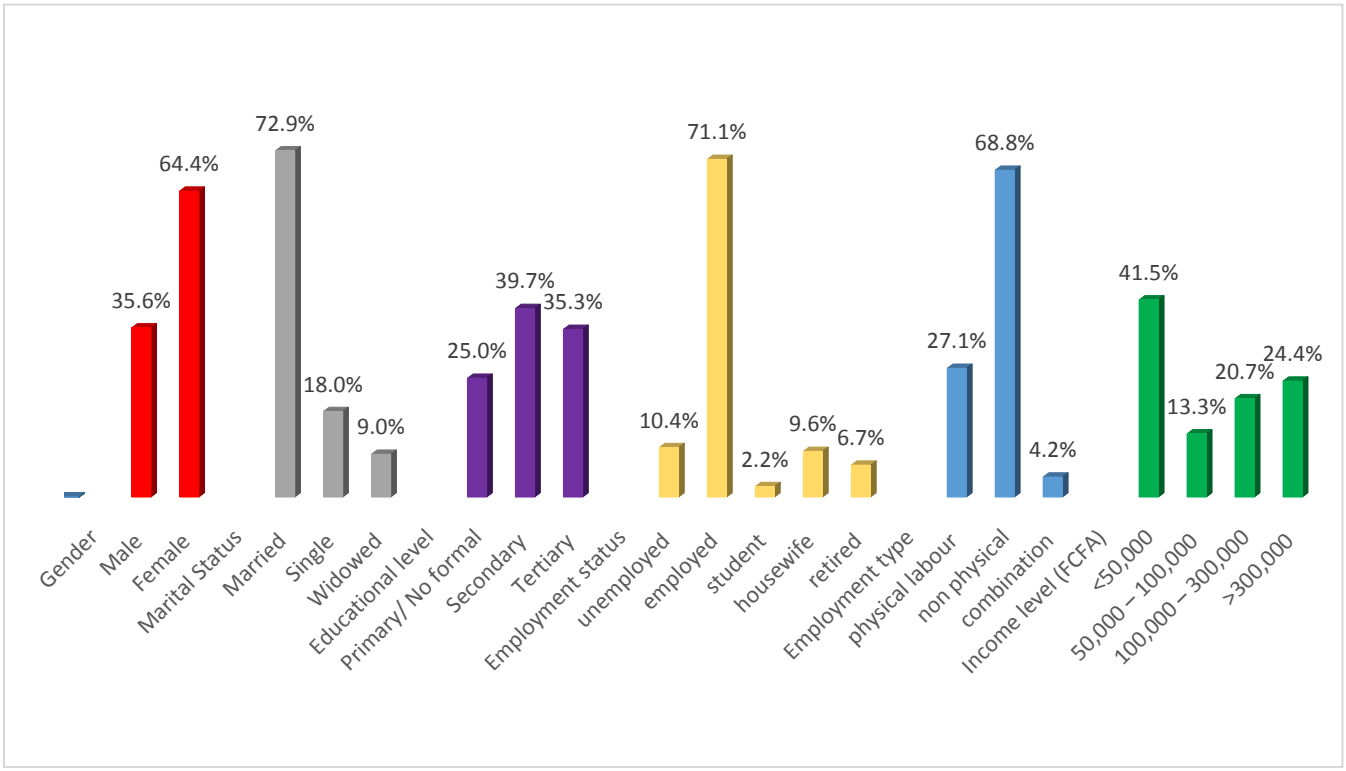

Figure 2a: Description of the study participants: Socio-demographic characteristics (N=136)

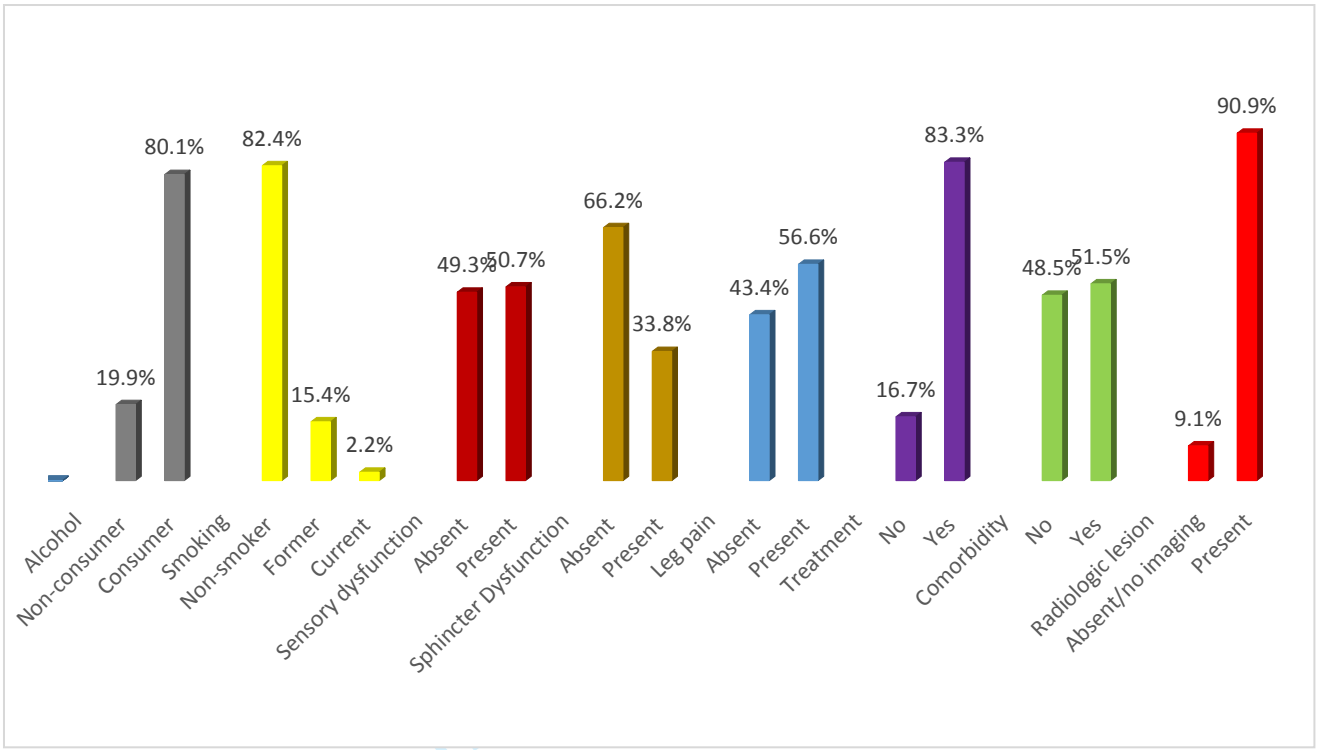

Figure 2b: Description of the study participants: Clinical characteristics (N=136)

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-6
Objectives	3	State specific objectives, including any prespecified hypotheses	5-6
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7-10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8-10
Bias	9	Describe any efforts to address potential sources of bias	6-7
Study size	10	Explain how the study size was arrived at	7, 10
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	11
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	10-11
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	10
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	13
		(b) Give reasons for non-participation at each stage	13
		(c) Consider use of a flow diagram	Figure 1
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	13, Figure 2
		(b) Indicate number of participants with missing data for each variable of interest	Figure 2
Outcome data	15*	Report numbers of outcome events or summary measures	13
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	13-15
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	11
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16-19
Generalisability	21	Discuss the generalisability (external validity) of the study results	16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	2

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Health-related quality of life and its determinants in patients with chronic low back pain at a tertiary hospital in Cameroon: a cross-sectional study.

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ABSTRACT

Objective: To evaluate health-related quality of life (HRQoL) and its determinants in chronic low back pain (CLBP) patients in Cameroon.

Design: Observational cross-sectional study.

Setting: Tertiary hospital.

Participants: 150 eligible adults with low back pain of at least twelve weeks provided informed consent. Of these, 136 with complete questionnaires were analyzed.

Outcomes: HRQoL was measured using the World Health Organization Quality of Life questionnaire (brief version). Outcome measures included its 4 domain scores (physical health, psychological, social relationships and environmental domains) and 2 independent scores for overall quality of life (OQOL) and general health satisfaction (GH).

Results: Participants had a median age of 52 years, and median pain duration of 33 (Interquartile range [IQR]: 69) months. The median OQOL score was 50 (IQR: 25). After multivariable adjustment, tertiary education (β= 11.43, 95% confidence interval (CI): 3.12 to 19.75), age (β= 0.49, 95% CI: 0.12 to 0.87) and being a student (β= 23.07, 95% CI: 0.28 to 45.86) contributed to better OQOL. Age (β= 0.57, 95% CI: 0.10 to 1.04) and physical-type employment (β= -14.57, 95% CI: -25.83 to -3.31) affected GH. Smoking (β= -20.49, 95% CI: -35.49 to -5.48) and radiologic anomalies (β= -7.57, 95% CI: -14.64 to -0.49) affected the physical health domain, while disability (β= -0.67, 95% CI: -1.14 to -0.20) and duration of pain (β= -0.13, 95% CI= -0.20 to -0.05) affected the psychological domain. Income (β= 14.94, 95% CI: 4.06 to 25.81) affected the social domain, while education (β= 9.96, 95% CI: 1.41 to 18.50) and disability (β= -0.75, 95% CI= -1.26 to -0.24) affected the environmental domain.

Conclusions: Our findings suggest that CLBP affects HRQoL and multiple socioeconomic and clinical factors influence its impact on different domains of HRQoL. Multipronged management programs, especially those that reduce disability could improve HRQoL in patients with CLBP.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- To the best of our knowledge, this is the first study in Cameroon to investigate the relationship between CLBP and HRQoL, and the determinants of specific HRQoL domains.
- We used a widely validated tool (WHOQOL-BREF) that allows for applicability across cultures and for comparisons between various settings.
- The absence of population norms for WHOQOL-BREF in Cameroon to serve as a reference limited our ability to establish relevant comparisons.
- We acknowledge that the cross-sectional design used in this study limits the establishment of causality in the associations identified.

INTRODUCTION

Low back pain (LBP) is an expanding health problem with a major impact on the general health and performance of populations worldwide. More than a third (38%) of the world's population suffer LBP in the course of a year [1, 2]. In 2017, LBP accounted for 850 Years Lived with Disability (YLD) per 100,000 population, and was the leading cause of disability globally [3]. On average, one in three adults in Africa have LBP. This was confirmed in a systematic review that reported a pooled adult prevalence of 32% and an average lifetime prevalence of 62% [4].

Cameroon is a lower-middle-income country in sub-Saharan Africa with a population of above 25 million [5] organized into 10 regions. The health system of the country consists of a public and private sector. The public sector which is the main health service provider is organized in a pyramidal manner under the control of the Ministry of Health and at its base 189 health districts. Health districts are primary care units made of several integrated health centres and a district hospital. Health care provision in these centres is largely ensured by nurses supported by doctors in a central district hospital. Specialist health services are generally localized within second-level facilities (regional hospitals) in each of the 10 administrative regions of the country. Tertiary hospitals are mainly located in the administrative (Yaounde) and economic (Douala) capital cities, and provide the highest level of specialized care. While little is known about the burden of LBP in primary care in Cameroon; it is the leading cause of specialist rheumatologic consultations [6, 7]. It equally causes considerable disability [8] and was considered the leading cause of YLD in 2017, with 652 YLD per 100,000 populations, increasing by 2% since 2015 [3].

Pain, muscle tension or stiffness, localized below the costal margin and above the inferior gluteal folds, with or without leg pain (sciatica) [9] is referred to as *acute LBP* when it lasts less than six weeks, *sub-acute LBP* when it lasts six to twelve weeks, and *chronic LBP* when

it lasts longer than twelve weeks [10]. Clinical and research emphasis is generally on chronic LBP because chronic pain is a recognized cause of reduced quality of life (QoL) [11].

QoL, a subjective concept, is defined in simple terms as a person's evaluation of his or her well-being and functioning in diverse domains of life [12]. The World Health Organization (WHO), defines QoL as an individual's perception of his or her position in life, in the context of the culture and value systems in which he or she lives, and in relation to his or her goals, expectations, standards, and concerns [13]. Health-related quality of life (HRQoL) though often used interchangeably with QoL [14], is considered by some as distinct or as a sub-concept of QoL [15, 16]. HRQoL pertains to an individual's evaluation of their experiences, and expectations in health-related aspects of their lives, notably; physical function, psychological well-being, subjective symptoms, social function and cognitive function [14, 15]. It is thought to equally extend to the individual's perception of health correlates like health risks, social support, sociocultural beliefs, and economic status [17].

The HRQoL of patients with CLBP (largely in non-African settings), has been explored and found to be reduced or sub-optimal [18–20]. Besides the obvious pain, multiple factors are implicated in this reduced HRQoL, some of which include; disability, fear of movement, impaired sleep quality, depression, anxiety, low income, low educational levels, lumbosacral radiculopathy and overweight/obesity [21–26]. Amongst these, disability (impaired physical function) is considered a core issue. Disability results in considerable work absence, lower productivity and poorer HRQoL [27–29].

The effect of CLBP on HRQoL has hitherto, not been investigated in the Cameroonian patient. Evidence of the possible contribution of unique demographic, clinical and socioeconomic factors in low-resource sub-Saharan African settings, and their influence on HRQoL in patients with CLBP is limited. In a bid to bridge this gap, we sought to assess HRQoL in Cameroonian CLBP patients using the World Health Organization Quality of Life

brief (WHOQOL-BREF) tool. We investigated the prevalence of perceived poor QoL, the prevalence of health dissatisfaction, and the factors associated with various domains of HRQoL in these patients.

MATERIALS AND METHODS

Study design and setting

A cross-sectional study was conducted from January to March 2017 at the Douala General Hospital (DGH). The DGH is a tertiary hospital that receives patients from all ten regions of Cameroon. The study was carried out at the rheumatology unit that has three consultant rheumatologists, who (on alternate days) run the outpatient consultations of the unit. Douala is a major city in the Littoral region and is the economic capital of Cameroon, with an estimated population of 2.7 million [30].

Patient and Public Involvement Statement

This research did not involve patients or public in the initial study design. However, patient representatives were invited to test the acceptability of two popular HRQoL measuring tools to determine which to use as principal outcome measure in our population (considering ease of understanding and time burden). Patients were again recruited to pretest the final questionnaire. Patients were not involved in the writing or editing of this document and were also not involved in the dissemination plans.

Sampling technique and study participants

The Cochran formula ($\mathbf{n = Z_{1-\alpha/2}^2 SD^2 / d^2}$) for calculating sample size required to estimate a variable mean was used**.** We set the confidence level to 95%, adopted a 5-point difference in the overall quality of life score (OQOL) of WHOQOL-BREF as our absolute error or precision and a standard deviation of 24.2 in the OQOL derived from a similar study in LBP

patients in Brazil in 2013 [27]. We obtained an estimated minimum sample size of 90 CLBP patients.

Consecutive sampling was used to recruit eligible and consenting adult patients aged 18 to 70 years. All patients presenting either de novo or for follow-up visits with complains of pain, muscle tension or stiffness, localized below the costal margin and above the inferior gluteal folds lasting no less than 12 weeks were considered. For clarity, the affected area of the body was shown in a human diagram. We excluded any patients who were pregnant, suspected to have cauda equina syndrome, or recent trauma. In addition, patients were excluded if they were unable to comprehend questions despite interviewer assistance. Figure 1 shows the flow diagram of participant selection leading to the final study sample.

Study procedures and data collection

Patients who fulfilled the study eligibility criteria and provided written informed consent were interviewed using a pre-tested structured questionnaire. Data collected were sociodemographic information, clinical data, as well as disability and quality of life assessment of participants. Questionnaires were available in English and French, the two official languages in Cameroon.

Sociodemographic characteristics:

Data on the following variables were collected; gender, age, marital status (single, married or widowed), employment status (employed, housewife, student, unemployed/retired), employment type (physical, non-physical), level of education (no education, primary, secondary and tertiary education), and average monthly income (< 50 000 FCFA, 50 000 - 100 000 FCFA, 100 000 - 300 000 FCFA, > 300 000 FCFA [1$US = 530FCFA]). Information on other characteristics like smoking status (current smoker, former smoker and non-smoker), alcohol use, and units of alcohol consumed per week (for consumers) were also obtained.

Clinical characteristics:

To clearly elucidate the duration of LBP, and cognizant of the remitting/recurring nature of LBP, the duration of pain was assessed in two ways. The total duration of LBP was recorded by asking participants the question; *"For how many years (months) have you had an ongoing low back pain problem?"*. This was adapted from the recommendations of the CLBP Research Task Force of the American National Institute of Health Pain Consortium [31]. Duration of their current pain episode was assessed by asking the question; *"How long (years/months) has it been since you went for a whole month without low back pain?"*, based on the definition of a LBP episode proposed by Vet et al. [32].

The assessment of pain intensity was done using the 100 mm visual analogue scale (VAS). Patients were asked to rate their pain level at the time of the interview. Other clinical data recorded included; leg pain, lower limb numbness/paresthesia (tingling, burning, electric-currents, numbness or "pins and needles" in the lower limbs), and bladder/bowel dysfunction symptoms (uncontrollable urges to urinate/stool, urine/stool leakages, or undue strain in stooling/initiating urine). In this study, we did not specifically identify the aetiology of these symptoms. In addition, the presence or absence of any comorbidity was documented. Patients' weight and height were measured and used to compute their body mass index (BMI). Seca® scales were used for weight measurement during which participants had to be without footwear and have on light clothing. For height measurement, the adult Leicester® stadiometer was placed against a wall, and participants (without shoes) stood upright while their heels and occiput were on the stadiometer. Measures were to the nearest 0.5 cm for height, and one decimal place for weight.

Assessment of disability:

The Roland Morris Disability Questionnaire (RMDQ), a subjective 24-item back pain-specific tool that assesses impairment in activities of daily living was used to assess disability. Responses to the 24 items were by either "yes" or "no", and a total score ranging from zero to 24 was generated by counting the number of "yes" responses (*yes* = 1 point and *no* = no point). Higher scores imply greater disability. The RMDQ is easily understood and available in validated English and French versions [33]. Work absence due to LBP was assessed in terms of *disability days,* which was defined as the number of days of restricted routine activity or work absence because of CLBP occurring within the 30 days preceding the interview.

Assessment of Health-Related Quality of Life (World Health Organization Quality of Life brief version– WHOQOL-BREF)

Most tools for measuring HRQoL are self-report questionnaires. The WHOQOL-BREF tool is a generic self-report HRQoL questionnaire (applicable to "healthy" and "sick" persons). It was developed using data from 15 countries including sub-Saharan African countries like Zambia and Zimbabwe. It is the brief version of the original one hundred item tool; WHOQOL-100. It is designed to be cross-culturally applicable and has been applied in clinical practice and research to measure health outcomes, monitor disease progress, and compare health states even across countries. In studies comparing generic HRQoL tools, WHOQOL-BREF was found to have good-to-excellent psychometric properties across disease states (especially in chronic disease) when compared with the most widely used of them all, the SF-36 [16, 34].

The WHOQOL-BREF tool consists of 26 items (questions/facets), 24 of which are divided into four domains: physical health domain (PHD), psychological domain (PSD), environmental domain (END), and social relationships domain (SRD). There are two separate

items evaluating the individual's satisfaction with state of health (general health score) and individual's perception of quality of life (overall quality of life score). Scores are organized such that higher scores imply better HRQoL. PHD explores activities of daily living, including dependence on medicines/medical aids, energy and fatigue, mobility, pain and discomfort, sleep and rest, and work capacity. PSD explores bodily image and appearance, negative feelings, positive feelings, self-esteem, spirituality/religion/personal beliefs, and thinking, learning, memory and concentration. SRD explores personal relationships, social support, and sexual activity. END explores financial resources, freedom, physical safety and security, accessibility and quality of health and social care, home environment, opportunities for acquiring new information and skills, participation in leisure activities, physical environment, pollution, noise, traffic and climate, and transport.

The WHOQOL-BREF questionnaire can be self-administered or interviewer-administered and responses are still valid allowing a 2-4 week period [35]. It was chosen due to its cross-cultural applicability, low administrative burden, sensitivity and responsiveness in chronic diseases states, and the availability of validated versions in Cameroon's national official languages (English and French). Each item of WHOQOL-BREF is scored on a 5-point likert scale. The item scores are then transformed into domain scores following the steps described in the WHOQOL-BREF manual [35]. While there are no established cut-off points for the WHOQOL-BREF domains to distinguish between "good" and "poor" HRQoL, two studies transformed the 2 individual items (general health score and overall quality of life score) into binary outcomes. In these studies, respondents with 2 points or less on a total of five (that is, rated their quality of life or health satisfaction as "poor" or "very poor"), were considered to have a poor outcome [20, 36].

Ethical considerations

Ethical approval to carry out the study was obtained from the University of Buea, Faculty of Health Sciences Institutional Review Board, with approval number: 2017/003/UB/SG/IRB/FHS. Written consent was obtained from all participants after careful explanation of the study scope and objectives. Strict anonymity and confidentiality were maintained during the handling of patient's records and response data. The study adhered to the World Medical Association's Declaration of Helsinki [37], and the study is reported in accordance with the STROBE guidelines.

Data management and statistical analysis

Data were cleaned and analyzed using the Statistical Package for Social Sciences (SPSS Inc, Chicago, Illinois, USA) version 20. Continuous variables were tested for normality using the Shapiro-Wilk's test. For ease of comparison, we report both the means with standard deviations, and the medians with 25th and 75th percentiles for all variables. Categorical variables were summarized using counts and percentages. The prevalence of poor overall quality of life (OQOL) and poor general health satisfaction (GHS) in CLBP was also estimated. Poor OQOL was considered as rating quality of life "poor" or "very poor" that is, cut-off scores of less than 3 points out of 5 of the original item score while moderate-to-good OQoL (≥ 3/5 points) for rating quality of life "neither poor nor good", "good" or "very good". Poor GHS (< 3/5 points), for rating satisfaction with health as "poor" or "very poor", and moderate-to-good GHS (≥ 3/5 points), patients rating satisfaction with health as "neither poor nor good", "good" or "very good".

GHS and OQOL scores were subsequently analyzed as continuous outcome variables. In bivariate analysis, Spearman's correlation coefficient was used to investigate associations of continuous independent variables with WHOQOL-BREF scores (PHD, PSD, END, SRD,

GHS and OQOL scores). In cases where WHOQOL-BREF scores were normally distributed we used analysis of variance (ANOVA) to explore differences in WHOQOL-BREF scores across categories, while for non-normally distributed data, we used the non-parametric Kruskal-Wallis test. Variables with a $p < 0.05$ in bivariate analysis were included in a multivariable model. Because residuals were approximately normally distributed, we used multivariate linear regression models to determine factors independently associated with WHOQOL-BREF scores while adjusting for age, sex and other confounders. We checked for evidence of multicollinearity in the independent continuous variables via a correlation matrix and then ran collinearity diagnostics to assess their tolerance and variance inflation factor (VIF). All VIFs were less than two, suggesting absence of any multicollinearity. Statistical significance was set at $p < 0.05$.

RESULTS

One hundred and eighty potentially eligible patients CLBP patients (identified based on examination of patient's hospital records) were approached. They were screened via questioning to exclude pregnancy and trauma, and to confirm ability to understand questions. One hundred and fifty, who were confirmed eligible and provided consent, were included in study. However, only one hundred and thirty-six with complete WHOQOL-BREF questionnaires were used in the final analysis (Figure 1). The median (25^{th} to 75^{th} percentile) age of participants was 52 (43 – 60) years, with a female: male ratio of 1.8:1. Detailed characteristics of our study participants can be found in Figure 2 and Figure 3.

Pain and duration of CLBP

Overall, the median (25^{th} – 75^{th} percentile) duration of CLBP was 33 (12 - 78) months. The median duration of the ongoing pain episode was 12 (3 -24) months and the median perceived pain intensity score at the time of the interview was 40 (20 - 59) mm. Participants on average reported 6 ± 10 days of work loss in the previous month due to LBP (Table 1).

Health-related quality of life

All scores of the WHOQOL-BREF were not normally distributed with the exception of the END score which was normally distributed. The median OQOL score of CLBP patients at DGH was 50.0 (50.0 -75.0). The general health satisfaction score median was 25 (0 – 50), significantly lower than the OQOL score ($p < 0.001$). Amongst the four domain scores, the highest score was in the psychological domain, median: 62.5 (47.9 – 70.8). The lowest was the environmental domain median: 53.1 (40.6 – 62.5), see Table 1 for more details. Overall, 7.4 % had a poor perceived OQOL, while 64.7% had poor GHS.

Factors influencing HRQoL domains

Physical Health Domain: In univariate analysis (Tables 1 and 2), the factors significantly related to poor PHD included; longer days of work absence, higher disability scores, higher reported pain intensity, current smoking, documented radiologic disease, and primary or no formal education versus tertiary level education.

Table 1: Measures of central tendency, spread and correlations of variables with WHOQOL-BREF scores

	Mean ± SD	*Median*	*25th*	*75th*		*PHD*	*PSD*	*SRD*	*END*	*OQOL*	*GHS*
Age, years	50.6 ± 12.2	52.0	43.0	60.0	r_s	-0.14	-0.16˜	**-0.24**	-0.11	0.07	0.01
					P	0.113	0.069	**0.008**	0.226	0.442	0.875
Units of Alcohol per week	5.5 ± 11.7	0.8	0.0	6.5	r_s	0.11	-0.10	-0.14	-0.05	-0.07	0.00
					P	0.252	0.294	0.141	0.581	0.488	0.986
Overall duration of CLBP, months	62.7 ± 85.5	33.0	12.0	78.0	r_s	-0.07	-0.04	-0.10	-0.02	0.11	0.05
					P	0.452	0.611	0.160	0.837	0.223	0.577
Duration of pain episode, months	25.85 ± 45.2	12.0	3.0	24.0	r_s	-0.11	**-0.24**	-0.16	-0.13	0.04	0.01
					P	0.221	**0.005**	0.068	0.140	0.674	0.958
BMI in kg/m²	29.6 ± 5.7	28.7	26.0	33.5	r_s	0.00	-0.13	-0.10	-0.08	0.05	-0.05
					P	0.970	0.146	0.289	0.378	0.595	0.559
Days of work loss	6.0 ± 10.2	0.0	0.0	7.0	r_s	**-0.24**	-0.05	-0.10	-0.12	-0.12	-0.10
					P	**0.005**	0.544	0.264	0.177	0.150	0.230
RMDQ score	12.8 ± 6.1	13.0	7.0	18.0	r_s	**-0.34**	**-0.41**	**-0.26**	**-0.26**	-0.16	**-0.27**
					P	**0.000**	**0.000**	**0.002**	**0.002**	0.073	**0.002**
Pain Intensity	41.3 ± 24.3	40.0	20.0	59.0	r_s	**-0.19**	**-0.34**	-0.11	-0.16	**-0.20**	**-0.26**
					P	**0.031**	**0.000**	0.317	0.070	**0.024**	**0.002**
PHD Score	51.6 ± 10.5	53.6	44.6	57.1							
PSD Score	59.9 ± 15.7	62.5	47.9	70.8							
SRD Score	59.4 ± 20.5	58.3	50.0	75.0							
END Score	51.2 ± 16.0	53.1	40.6	62.5							
OQOL Score	59.6 ± 17.0	50.0	50.0	75.0							
GHS Score	31.4 ± 25.5	25.0	0.0	50.0							

Note: r_s = Spearman's correlation coefficient, SD = standard deviation, PHD = physical health domain, PSD = psychological domain, SRD = social relationship domain, END = environmental domain, OQOL = overall quality of life, GHS = general health satisfaction, CLBP = chronic low back pain, BMI = body mass index, RMDQ = Roland Morris Disability questionnaire.

Table 2: Univariate analysis showing differences in HRQoL domain scores across socio-demographic and clinical categories

	PHD				*PSD*				*SRD*				*END*	
	Median	***25th***	***75th***	***p***	***Median***	***25th***	***75th***	***p***	***Median***	***25th***	***75th***	***p***	***Mean ± SD***	***P***
Sociodemographic														
Gender				0.586				0.282				0.882		0.059
Male	53.6	42.9	57.1		66.7	47.9	75.0		66.7	50.0	75.0		54.6 ± 18.5	
Female	50.0	46.4	57.1		58.3	45.8	70.8		58.3	50.0	75.0		49.2 ± 14.3	
Marital Status				0.078				0.184				0.447		0208
Married	53.6	46.4	57.1		62.5	45.8	70.8		58.3	50.0	75.0		50.8 ± 16.8	
Single	57.1	48.2	60.7		66.7	56.3	75.0		66.7	50.0	75.0		55.3 ± 13.4	
Widow	44.6	41.1	53.6		56.3	45.8	64.6		66.7	45.8	79.2		45.5 ± 15.2	
Level of Education				**0.023**				**0.036**				**0.011**		**0.000**
Primary /no formal	**50.0[a]**	**42.9**	**57.1**		**58.3**	**45.8**	**70.8**		**50.0[a]**	**33.3**	**66.7**		**43.4 ± 14.4[a]**	
Secondary	**51.8**	**42.9**	**57.1**		**58.3[a]**	**41.7**	**70.8**		**58.3**	**41.7**	**75.0**		**50.3 ± 16.7**	
Tertiary	**57.1[b]**	**46.4**	**60.7**		**66.7[b]**	**54.2**	**75.0**		**66.7[b]**	**58.3**	**75.0**		**57.8 ± 13.7[b]**	
Employment status				0.293				0.069				0.226		0.423
Unemployed	50.0	42.9	57.1		56.3	45.8	62.5		54.2	33.3	58.3		44.4 ± 15.2	
Employed	53.6	46.4	60.7		66.7	50.0	75.0		66.7	50.0	75.0		52.1 ± 16.6	
Student	57.1	50.0	64.3		58.3	54.2	70.8		58.3	33.3	75.0		52.1 ± 11.0	
Housewife	50.0	46.4	57.1		58.3	50.0	62.5		58.3	41.7	66.7		48.3 ± 13.3	
Retired	42.9	39.3	57.1		50.0	37.5	62.5		66.7	50.0	75.0		55.6 ± 16.7	
Employment type				0.358				0.635				0.160		0.642
Physical	50.0	42.9	57.1		66.7	41.7	75.0		50.0	33.3	75.0		52.9 ± 17.7	
Non-physical	55.4	46.4	60.7		62.5	50.0	75.0		66.7	58.3	75.0		52.3 ± 15.7	
Combination	53.6	42.9	57.1		75.0	54.2	81.3		54.2	33.3	75.0		44.5 ± 25.6	
Income (thousand FCFA)				0.351				0.075				**0.008**		**0.022**
< 50	50.0	42.9	57.1		58.3	50.0	66.7		**58.3[a]**	**33.3**	**70.8**		**48.0 ± 14.5[a]**	
50 – 100	53.6	46.4	57.1		56.7	40.0	70.8		**66.7**	**50.0**	**75.0**		**46.4 ± 13.7**	
100 – 300	57.1	46.4	60.7		66.7	47.9	75.0		**66.7**	**58.3**	**79.2**		**54.5 ± 11.5**	
> 300	53.6	46.4	60.7		66.7	54.2	75.0		**66.7[b]**	**50.0**	**75.0**		**57.1 ± 20.6[b]**	
Alcohol Consumption				0.267				0.273				0.499		0.885
Non-consumer	53.6	41.7	57.1		58.3	45.8	66.7		66.7	33.3	83.3		51.6 ± 19.1	
Consumer	53.6	46.4	57.1		62.5	50.0	75.0		58.3	50.0	75.0		51.1 ± 15.3	
Smoking				**0.049**				0.298				0.704		0.193

Non-smoker	**53.6[a]**	**44.6**	**57.1**		62.5	47.9	70.8		62.5	50.0	75.0		50.6 ± 15.1	
Former	**57.1[a]**	**50.0**	**60.7**		66.7	54.2	75.0		58.3	41.7	66.7		56.1 ± 18.3	
Current	**35.7[b]**	**21.4**	**50.0**		58.3	37.5	62.5		50.0	16.7	83.3		41.2 ± 30.8	
Clinical														
Numbness or paraesthesia				0.389				0.088				0.179		0.079
Absent	53.6	46.4	57.1		66.7	54.2	75.0		66.7	50.0	75.0		53.7 ± 15.5	
Present	50.0	42.9	57.1		58.3	45.8	70.8		58.3	41.7	66.7		48.8 ± 16.3	
Sphincter dysfunction				0.074˜				0.075				**0.022**		**0.018**
Absent	53.6	46.4	60.7		62.5	54.2	75.0		**66.7**	**50.0**	**75.0**		**53.5 ± 14.8**	
Present	50.0	42.9	57.1		58.3	41.7	70.8		**58.3**	**33.3**	**75.0**		**46.7 ± 17.4**	
Leg pain				0.427				0.765				0.882		0.973
Absent	53.6	46.4	60.7		62.5	50.0	75.0		66.7	50.0	75.0		51.2 ± 15.8	
Present	53.6	42.9	57.1		62.5	45.8	70.8		58.3	41.7	75.0		51.3 ± 16.3	
Receiving treatment				0.745				0.635				0.120		0.790
No	51.8	50.0	57.1		62.5	45.8	70.8		66.7	50.0	75.0		52.1 ± 11.3	
Yes	53.6	42.9	57.1		62.5	50.0	75.0		58.3	41.7	75.0		51.1 ± 17.0	
Comorbidity				0.898				0.892				0.437		0.140
Absent	53.6	42.9	57.1		58.3	50.0	70.8		66.7	50.0	75.0		49.0 ± 15.6	
Present	50.0	46.4	57.1		62.5	45.8	75.0		58.3	50.0	66.7		53.1 ± 16.5	
Radiologic lesions				**0.036**				0.656				**0.041**		0.100
Present	**53.6**	**57.1**	**60.7**		60.4	55.0	75.0		**58.3**	**66.7**	**75.0**		49.2 ± 16.3	
Absent/ not requested	**57.1**	**42.9**	**60.7**		62.5	45.8	70.8		**75.0**	**41.7**	**75.0**		58.8 ± 18.8	

Note: SD = Standard deviation

˜ Mean or median differences non-significant, at < 0.1 level.

[a-b] Mean or medians in categories with unidentical superscript letters differ ($P < 0.05$), following post-hoc analysis.

In multivariate analysis, factors that independently influenced HRQoL in the physical domain included; current smoking (β = -20.49, p = 0.008), and documented radiologic disease (β = -7.57, p=0.036). The model explained 22.6% of the variance in the PHD scores (Table 3).

Psychological Domain: In the univariate analysis, factors associated with poorer HRQoL in the psychological domain were; the duration of a pain episode, higher RMDQ score, and secondary education when compared to tertiary education (reference category) (Table 1 and Table 2).

However only the RMDQ score (β = -0.67, p = 0.006) and the LBP episode (β = -0.13, p = 0.001) significantly influenced the PSD in multivariate analysis. The model explained 26.1% of the variance in the PSD scores (Table 3).

Social Relationships Domain: Lower SRD scores were associated with older age, sphincter dysfunction, documented radiologic lesions, primary education versus tertiary and an income below 50,000 FCFA versus one above 300 000 FCFA (Table 1 and Table 2).

In the multivariate model, the only independent predictor of SRD was income. Monthly incomes of 50 000 FCFA to 100 000 FCFA (β = 12.42, p = 0.044) and 100 000 FCFA to 300 000 FCFA (β = 14.94, p = 0.008) were associated with better SRD scores when compared with income below 50 000 FCFA. The model explained 13.4% of the variance in SRD scores (Table 3).

Environmental Domain: Univariate analysis revealed that lower END scores were associated with higher RMDQ scores, primary versus tertiary education, an income below 50,000 FCFA versus one above 300 000, and sphincter dysfunction (Table 1 and Table 2).

Factors independently associated with higher END scores were; tertiary level education (β = 9.96, p = 0.023) and RMDQ score (β = -0.75, p = 0.004). The model explained 15.4% of the variance in END scores (Table 3).

Table 3: Multivariate regression models showing factors independently associated with WHOQOL-BREF domain scores.

Physical Health domain (PHD) (aR^2 = 0.226)			
		β	**95% CI**
SOCIODEMOGRAPHIC			
Gender	Male	1	
	Female	1.29	-3.41, 5.99
Marital status	Married	1	
	Single	1.72	-4.45, 7.89
	Widow	-6.40	-14.0, 1.20
Level of Education	Primary/no formal	1	
	Secondary	-0.53	-5.68, 4.62
	Tertiary	-0.27	-5.71, 5.18
Smoking	Non-smoker	1	
	Former	5.92	-0.02, 11.87
	Current	**-20.49****	**-35.49, -5.48**
CLINICAL			
Sphincter Dysfunction	Absent	1	
	Present	-2.43	-6.75, 1.89
Radiological Lesion	Absent / not requested	1	
	Present	**-7.57***	**-14.64, -0.49**
Age, years		0.02	-0.18, 0.22
Work loss, days		-0.14	-0.35, 0.07
RMDQ score		-0.25	-0.67, 0.16
Pain intensity		-0.06	-0.17-0.04
Social Relationships domain (SRD) (aR^2 = 0.134)			
		β	**95% CI**
SOCIODEMOGRAPHIC			
Gender	Male	1	
	Female	5.59	-3.59, 14.78
Level of Education	Primary/no formal	1	
	Secondary	0.93	-9.24, 11.11
	Tertiary	5.61	-5.63, 16.86
Income (thousand FCFA)	< 50	1	
	50-100	**12.42***	**0.36, 24.49**

Psychological domain (PSD) (aR^2 = 0.261)			
		β	**95% CI**
SOCIODEMOGRAPHIC			
Gender	Male	1	
	Female	0.14	-6.14, 6.42
Level of Education	Primary/ no formal	1	
	Secondary	-5.71	-12.54, 1.13
	Tertiary	1.32	-6.64, 9.29
Employment status	Unemployed	1	
	Employed	2.47	-7.50, 12.45
	Student	7.63	-12.31, 27.57
	Housewife	4.56	-6.68, 15.79
	Retired	-3.92	-17.28, 9.44
Income (thousand FCFA)	< 50	1	
	50-100	-2.17	-11.17, 6.84
	100-300	0.88	-8.21, 9.96
	>300	4.10	-5.47, 13.66
CLINICAL			
Numbness/ Paraesthesia	Absent	1	
	Present	-2.06	-7.39, 3.28
Sphincter Dysfunction	Absent	1	
	Present	-1.44	-7.18, 4.30
Age, years		0.03	-0.24, 0.30
Duration of pain episode		**-0.13****	**-0.20, -0.05**
RMDQ score		**-0.67****	**-1.14, -0.20**
Pain intensity		-0.08	-0.20, 0.04
Environmental domain (END) (aR^2 = 0.154)			
		β	**95% CI**
SOCIODEMOGRAPHIC			
Gender	Male	1	
	Female	0.21	-6.42, 6.84
Level of Education	Primary/no formal	1	
	Secondary	4.80	-2.63, 12.22

	100-300	**14.94***	**4.06, 25.81**
	>300	9.26	-2.82, 21.35
CLINICAL			
Sphincter dysfunction	Absent	1	
	Present	-4.90	-12.98, 3.17
Radiological lesion	Absent/ not requested	1	
	Present	-8.27	-21.76, 5.21
Age, years		0.05	-0.31, 0.41
Duration of pain episode		0.04	-0.06, 0.14
RMDQ score		-0.59	-1.22, 0.05
Overall Quality of life (OQOL) (aR^2 = 0.129)			
		β	**95% CI**
SOCIODEMOGRAPHIC			
Gender	Male	1	
	Female	2.01	-4.89, 8.90
Level of Education	Primary/no formal	1	
	Secondary	5.39	-2.64, 13.41
	Tertiary	**11.43****	**3.12, 19.75**
Employment status	Unemployed	1	
	Employed	8.57	-1.28, 18.42
	Student	**23.07***	**0.28, 45.86**
	Housewife	14.87	-0.22, 29.96
	Retired	10.15	-5.35, 25.65
CLINICAL			
Numbness/Paraesthesia	Absent	1	
	Present	-6.22	-12.71, 0.26
Comorbidity	Absent	1	
	Present	1.75	-5.14, 8.63
Radiological lesion	Absent/ not requested	1	
	Present	-10.52	-21.45, 0.41
Age, years		**0.49***	**0.12, 0.87**
RMDQ score		-0.45	-1.06, 0.16
Pain intensity		-0.01	-0.17, 0.14
	Tertiary	**9.96***	**1.41, 18.50**
Income (thousand FCFA)	< 50	1	
	50-100	-2.09	-10.61, 6.44
	100-300	3.13	-5.04, 11.30
	>300	5.63	-3.12, 14.38
CLINICAL			
Numbness/ Paraesthesia	Absent	1	
	Present	-3.76	-9.50, 1.97
Sphincter dysfunction	Absent	1	
	Present	-3.01	-9.08, 3.07
Age, years		0.15	-0.11, 0.40
RMDQ score		**-0.75****	**-1.26, -0.24**
Pain intensity		0.09	-0.05, 0.22
General Health Satisfaction (GHS) (aR^2 = 0.188)			
		β	**95% CI**
SOCIODEMOGRAPHIC			
Gender	Male	1	
	Female	1.73	-8.15, 11.61
Employment type	Non-physical	1	
	Physical	**-14.57***	**-25.83, -3.31**
	Combination	14.98	-9.41, 39.37
CLINICAL			
Sphincter Dysfunction	Absent	1	
	Present	-5.73	-16.75,5.30
Age, years		**0.57***	**0.10, 1.04**
RMDQ score		-0.93	-1.88, 0.01
Pain intensity		-0.21	-0.45, 0.04

β = beta coefficient, CI = confidence interval. *** = Beta coefficient significant at < 0.001 level. **= Beta coefficient significant at < 0.01 level. * = Beta coefficient significant at < 0.05 level.

Overall Quality of Life and General Health Satisfaction: Higher perceived pain intensity was significantly associated with lower GHS and OQOL scores. Disability negatively influenced GHS but not OQOL. OQOL differed significantly in those with limb numbness/paraesthesia while the GHS score was significantly lower in those employed in physical effort requiring jobs compared to those who were not (Table 1 and Table 4).

In the multivariate analysis, tertiary education ($\beta = 11.43$, $p = 0.008$), increasing age ($\beta = 0.49$, $p = 0.010$) and being a student ($\beta = 23.07$, $p = 0.047$) were independently associated with OQOL. The model explained 12.9% of the variance in the OQOL score. Amongst the domain scores, higher SRD scores ($\beta = 0.19$, $p = 0.005$) and END scores ($\beta = 0.47$, $p < 0.001$) were associated with better OQOL (Table 5).

Based on multivariate analysis, variables independently associated with GHS were; age ($\beta = 0.57$, $p = 0.017$) and physical-type employment ($\beta = -14.57$, $p = 0.012$), with the model explaining 18.8% of the variance in GHS scores. No domain score was significantly related to the GHS score (Table 5).

Table 4: Univariate analysis showing OQOL and GHS score differences across sociodemographic and clinical categories

	OQOL				*GHS*					*OQOL*				*GHS*			
	Median	***25th***	***75th***	***p***	***Median***	***25th***	***75th***	***p***		***Median***	***25th***	***75th***	***p***	***Median***	***25th***	***75th***	***P***
Gender				0.737				0.575	Alcohol use				0.154				0.497
Male	50.0	50.0	75.0		25.0	25.0	50.0		*Non-consumer*	75.0	50.0	75.0		25.0	0.0	75.0	
Female	50.0	50.0	75.0		25.0	0.0	50.0		*Consumer*	50.0	50.0	75.0		25.0	0.0	50.0	
Marital Status				0.301				0.422	Smoking				0.826				0.928
Married	50.0	50.0	75.0		25.0	0.0	50.0		*Non-smoker*	50.0	50.0	75.0		25.0	0.0	50.0	
Single	50.0	50.0	75.0		25.0	25.0	50.0		*Former*	50.0	50.0	75.0		25.0	25.0	50.0	
Widow	75.0	50.0	75.0		25.0	12.5	25.0		*Current*	50.0	50.0	75.0		25.0	0.0	50.0	
Level of Education				0.078˜				2.08	Numbness or paraesthesia				0.030*				0.191
Primary/ no formal	50.0	50.0	75.0		25.0	0.0	50.0	0.353	*Absent*	**50.0**	50.0	75.0		25.0	25.0	50.0	
Secondary	50.0	50.0	75.0		25.0	25.0	50.0		*Present*	**50.0**	50.0	75.0		25.0	0.0	50.0	
Tertiary	75.0	50.0	75.0		25.0	25.0	50.0		Sphincter dysfunction				0.105				0.061 ˜
Employment status				0.057˜				0.266	*Absent*	50.0	50.0	75.0		25.0	25.0	50.0	
Unemployed	50.0	50.0	50.0		25.0	0.0	50.0		*Present*	50.0	50.0	75.0		25.0	0.0	50.0	
Employed	50.0	50.0	75.0			25.0	50.0		Leg pain				0.714				0.319
Student	50.0	50.0	75.0		25.0	0.0	50.0		*Absent*	50.0	50.0	75.0		25.0	25.0	50.0	
Housewife	50.0	50.0	75.0		50.0	0.0	25.0		*Present*	50.0	50.0	75.0		25.0	0.0	50.0	
Retired	75.0	50.0	75.0		0.0	25.0	50.0		Receiving treatment				0.790				0.237
Employment type				0.979				**0.042***	*No*	50.0	50.0	75.0		37.5	25.0	50.0	
Physical	50.0	50.0	75.0		**25.0** [a]	0.0	25.0		*Yes*	50.0	50.0	75.0		25.0	0.0	50.0	
Non-physical	50.0	50.0	75.0		**50.0** [b]	25.0	50.0		Comorbidity				0.051˜				0.376
Combination	75.0	25.0	75.0		**25.0**	12.5	75.0		*Absent*	50.0	50.0	75.0		25.0	0.0	50.0	
Income (thousand FCFA)				0.122				0.713	*Present*	50.0	50.0	75.0		25.0	25.0	50.0	
< 50	50.0	50.0	75.0		25.0	0.0	50.0		Radiologic lesions				0.053˜				0.380
50 – 100	50.0	50.0	75.0		25.0	25.0	50.0		*Present*	75.0	50.0	75.0		25.0	0.0	25.0	
100 – 300	75.0	50.0	75.0		25.0	0.0	75.0		*Absent/ not requested*	50.0	50.0	75.0		25.0	25.0	50.0	
>300	62.5	50.0	75.0		25.0	25.0	50.0										

** = Median differences significant at <0.01 level.

* = Median differences significant at <0.05 level.

˜ = Median differences non-significant, at < 0.1 level.

[a-b] = Medians in categories with unidentical superscript letters differ ($P < 0.05$), following post-hoc analysis

Table 5: Multivariate regression model showing the influence of various domains on OQOL and GHS scores.

	OQOL		*GHS*	
	$aR^2 = 0.317$		*$aR^2 = 0.055$*	
	B	**95% CI**	**β**	**95% CI**
Physical health domain	-0.20	-0.46, 0.07	0.32	-0.16, 0.79
Psychological domain	0.10	-0.08, 0.28	0.26	-0.06, 0.58
Social relationships domain	**0.19****	**0.06, 0.33**	0.05	-0.18, 0.28
Environmental domain	**0.47*****	**0.27, 0.66**	0.07	-0.27, 0.41

β = beta coefficient, CI = confidence interval

*** Beta coefficient significant at < 0.001 level.

** Beta coefficient significant at < 0.01 level.

* Beta coefficient significant at < 0.05 level.

DISCUSSION

Chronic pain is a recognized cause of reduced quality of life, but the dimensions and extent of the impact it has on HRQoL are subject to variations based on the individual, the disease, and even the environment. The aim of this study was therefore to describe HRQoL and its determinants in CLBP patients in Cameroon. Determinants of HRQoL differed for various WHOQOL-BREF component domains. Being a current smoker and having radiologic disease predicted poorer physical health, while increased disability (higher RMDQ scores) and longer LBP episodes predicted poorer psychological health. Higher income predicted better social relationships while higher levels of education and less disability (lower RMDQ scores) predicted better environmental health. Tertiary education, older age and being a student predicted better OQOL. On the other hand, older age and non-physical-type employment were associated with greater general health satisfaction.

The average OQOL score for CLBP patients in our study was about half of the maximum score. Similar scores were reported among other CLBP patients in countries with better living standards (higher per capita GDP) such as Brazil and Poland [27, 38–40]. While, in studies with a mixed population of acute and chronic LBP patients, higher average scores were reported [18, 19], strengthening the argument that CLBP has an impact on quality of life, and the chronic nature of the pain likely contributes to this effect [11].

The average general health satisfaction score for our CLBP patients was significantly lower than the average overall quality of life score, as was similarly reported in Polish patients [41]. More so, dissatisfaction with general health was common (more than two-thirds of our patients), while less than a tenth rated their quality of life as poor. In an Austrian study [20], though a similar disparity was observed between the two scores, health dissatisfaction was less common (about a quarter of their patients) than in our cohort. In addition, the proportion of persons in this study who rated their OQOL as “very bad” or “bad” was comparable to ours

(8.6% in men and 14.7% in women). This may be linked to the fact that patients in this study were recruited from the community (as opposed to hospital setting in our study) and possibly in better physical health states, hence more satisfied with their health comparatively. It could also be a reflection of better healthcare access and quality for the Austrian population in general. On the other hand, the consistent disparity between health satisfaction and self-rated overall quality of life appears to indicate that while CLBP clearly influences perceived health status, its effect on quality of life is seemingly not a direct one. Quality of life appears to be a broader indicator with multiple determinants.

Moving into the specific domain scores, the environmental domain score was the most impaired HRQoL domain in our patients. A similar finding was observed in Brazil [38]. However, the physical domain which was scored slightly better than the END by our patients (third most impaired domain) has been more commonly identified as most affected in similar patient groups in Iran, Austria, Brazil, Poland and Bosnia [18, 20, 27, 39, 42]. When consideration is given to the specific items (satisfaction with finances, physical security, accessibility of health care, quality of health/social care, home environment, participation in leisure activities, pollution, noise, traffic and transport) assessed in the END score, it is likely that the low scores found in our patients may reflect the comparatively low standards of living in our population, and limited infrastructure adapted for persons with disability.

The highest scored (least impaired) domains of HRQoL in our study were the psychological domain, followed by the social relationships domain. This order was rather uncommon in other literature. In most other LBP patient groups (Iran, Taiwan, Austria, Brazil, Poland and Bosnia) [18–20, 27, 38, 39, 41, 42], the SRD was the highest, with the PSD usually falling much lower in the third place. The PSD scores were reported to be most impaired (lowest) in two studies in Taiwan and Poland [19, 41]. We found this difference in perceived psychological wellbeing between our patients and those in other settings rather peculiar. We

speculate that it may be related to sociocultural particularities in our setting that could be further investigated.

There was no difference in HRQoL domain scores between males and female CLBP patients in our study, and in some others [18, 27]. One study however, reported better PSD scores in males with CLBP compared to females [42]. In a like manner, age did not affect any of the HRQoL domains in our patients, but findings in previous literature have thus far been variable. For example, in a cohort of CLBP patients in Brazil, older age was associated with poorer scores in all four domains [27]. In Bosnia, older patients had poorer PSD and PHD scores [42]. However, our findings are mirrored in a Polish study with similar mean age [39].

In some other studies pain intensity significantly influenced certain HRQoL domains [19, 39]. However, for ours, it had no significant influence on any HRQoL score after controlling for confounders. On the other hand, disability is also described in literature as a key predictor of lower quality of life in CLBP [19, 27, 41]. Disability in our patients was associated strongly with the PSD score, less so with the END, and not at all with the PHD after eliminating confounders, which is at variance with other reports [19, 27, 41]. In addition, this study found no relation between disability and perception of overall quality of life contrary to findings in Taiwanese and Polish cohorts [19, 41].

After controlling for age, sex, and other sociodemographic and clinical variables, being a current smoker and having documented radiologic lesions were the only factors independently associated with worse physical health scores. Smoking has been previously explored in Brazilian CLBP patients, but was found to have no influence on the PHD [27]. On examination of predictors of PSD, in addition to a strong relationship between disability and psychological quality of life, persons with a longer duration of their back-pain episode also had poorer PSD quality of life. Duration however did not influence any other HRQoL score. In a Polish cohort, duration of LBP rather influenced the END score [39].

In our study, tertiary education predicted better environmental quality of life while higher income predicted better social quality of life. Education equally seemed to play a role in perceived OQOL. Students and persons with university-level education had higher scores. Our results did not conform to previous reports [27, 39] in which educational level and income did not significantly influence any of the HRQoL scores after controlling for confounders. This could reflect the better socioeconomic equality of the population in these countries. Examining employment in more detail revealed that work type seems to influence health satisfaction in our CLBP patients and logically so. Subjects whose professional occupations involved physical exertion had significantly lower health satisfaction.

Environmental quality of life and social quality of life predicted patients' perception of their overall quality of life. A previous study rather discovered a relationship between OQOL and the physical and psychological domain scores [19]. These findings illustrate how factors unique to each population setting could influence HRQoL in identical disease states.

This study had certain limitations. Using a cross-sectional study design limited our ability to determine causality, as would have been possible with a prospective cohort design. In addition, our study was prone to selection bias owing to the use of a non-random sampling technique and the selected nature (hospital-based) of the study. Our findings cannot be generalized without caution as they likely reflect the situation at the study facility. Furthermore, we did not explicitly assess the aetiology of associated symptoms. We acknowledge that they may have been due to other health problems and not necessarily LBP. Finally, there is no culturally adapted, validated, generic HRQoL questionnaire specific for Cameroon. Furthermore, there are no population norms for WHOQOL-BREF in Cameroon. This lack of a reference limits our possibility to carefully analyze health outcomes.

However, we sought to reduce some of the bias by choosing a widely validated tool specially developed to be applied across cultures and permit comparisons across various settings.

Future research to develop a culturally adapted generic HRQoL tool for our setting and establish population norms of existing tools could go a long way to improving evaluation of the impact of CLBP on HRQoL.

Conclusions

Our results suggest that CLBP impedes the HRQoL of affected patients. The factors that influence HRQoL in CLBP patients vary across its various component domains. Multi-component management strategies, especially those that reduce disability and mitigate environmental and socioeconomic barriers to healthcare should be considered to improve the HRQoL in patients with CLBP. To the best of our knowledge, this study is the first of its kind in Cameroon to provide evidence on the health-related quality of life of patients with chronic low back pain, as well as the determinants of quality of life in this population. Our findings are thus relevant for health policy makers, as it has unearthed significant determinants that could be targeted in order to allay the burden of CLBP.

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Competing interests' statement

None declared.

Authors contributions

Study conception and design: JAA, LNA, MDB. Data collection: JAA, MDB, FKL, FMK. Statistical analysis: JAA and LNA. Drafting of manuscript: JAA and LNA. Critical review of manuscript: LNA, MDB, JAA, AMC, EVY.

Data availability statement

Deidentified participant data are available upon reasonable request from the corresponding author: jeannineatemanyingu@rocketmail.com; ORCID identifier: 0000-0003-3149-6494.

ABBREVIATIONS

LBP	Low back pain
CLBP	Chronic low back pain
YLD	Years lived with disability
QoL	Quality of life
HRQoL	Health-related quality of life
WHO	World Health Organization
WHOQOL-BREF	World Health Organization Quality of Life Brief
DGH	Douala General Hospital
VAS	Visual analogue scale
BMI	Body mass index
RMDQ	Roland Morris Disability Questionnaire
PHD	Physical health domain
PSD	Psychological domain
END	Environmental domain
SRD	Social relationships domain
OQOL	Overall quality of life
GHS	General health satisfaction
SPSS	Statistical Package for Social Sciences
VIF	Variance inflation factor
IQR	Interquartile range
SD	Standard deviation
CI	Confidence interval
GDP	Gross domestic product

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FIGURE LEGENDS

Figure 1: Derivation of final study population.

Figure 2: Description of socio-demographic characteristics of the study participants (N=136).

Figure 3: Description of the clinical characteristics of the study participants (N=136).

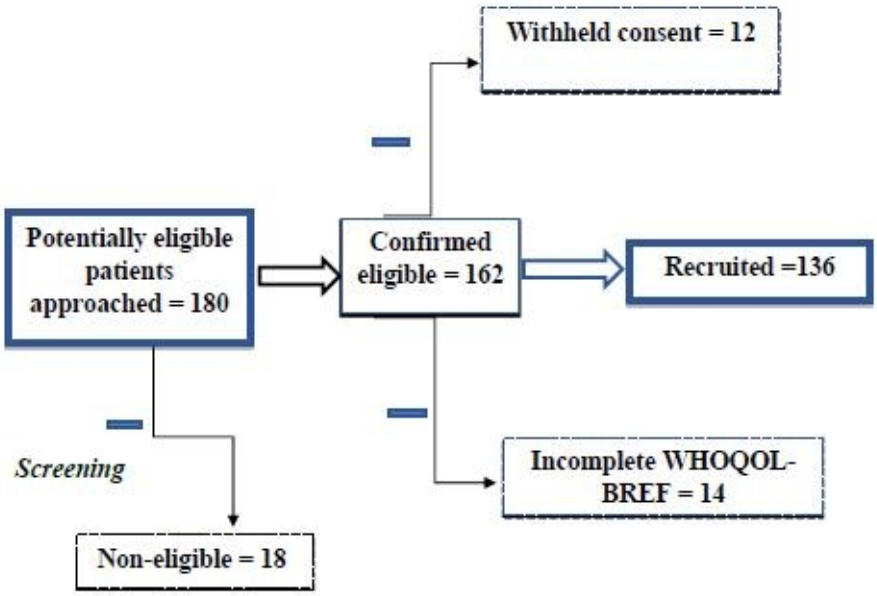

Figure 1: Derivation of final study population

Derivation of final study population.

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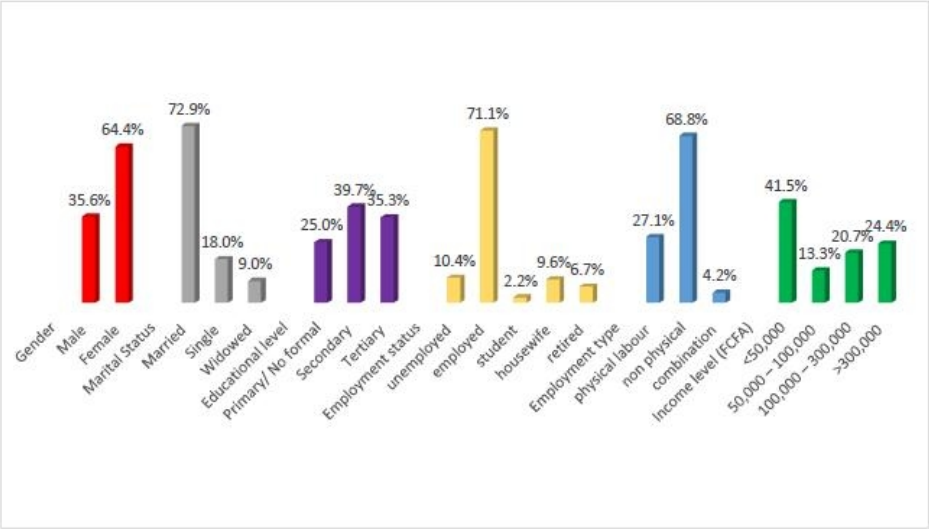

Figure 2: Description of the study participants: Socio-demographic characteristics (N=136)

Description of socio-demographic characteristics of the study participants (N=136).

58x39mm (300 x 300 DPI)

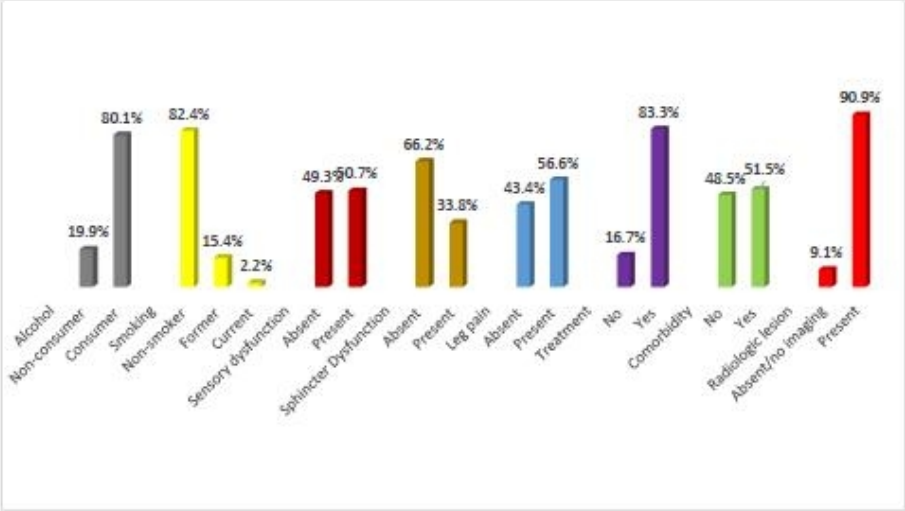

Figure 3: Description of the study participants: Clinical characteristics (N=136)

Description of the clinical characteristics of the study participants (N=136).

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Health-related quality of life and its determinants in patients with chronic low back pain at a tertiary hospital in Cameroon: a cross-sectional study.

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Health-related quality of life and its determinants in patients with chronic low back pain at a tertiary hospital in Cameroon: a cross-sectional study.

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ABSTRACT

Objective: To evaluate health-related quality of life (HRQoL) and its determinants in chronic low back pain (CLBP) patients in Cameroon.

Design: Observational cross-sectional study.

Setting: Tertiary hospital.

Participants: 150 eligible adults with low back pain of at least twelve weeks provided informed consent. Of these, 136 with complete questionnaires were analyzed.

Outcomes: HRQoL was measured using the World Health Organization Quality of Life questionnaire (brief version). Outcome measures included its 4 domain scores (physical health, psychological, social relationships and environmental domains) and 2 independent scores for overall quality of life (OQOL) and general health satisfaction (GH).

Results: Participants had a median age of 52 years, and median pain duration of 33 (Interquartile range [IQR]: 69) months. The median OQOL score was 50 (IQR: 25). After multivariable adjustment, tertiary education (β= 11.43, 95% confidence interval (CI): 3.12 to 19.75), age (β= 0.49, 95% CI: 0.12 to 0.87) and being a student (β= 23.07, 95% CI: 0.28 to 45.86) contributed to better OQOL. Age (β= 0.57, 95% CI: 0.10 to 1.04) and physical-type employment (β= -14.57, 95% CI: -25.83 to -3.31) affected GH. Smoking (β= -20.49, 95% CI: -35.49 to -5.48) and radiologic anomalies (β= -7.57, 95% CI: -14.64 to -0.49) affected the physical health domain, while disability (β= -0.67, 95% CI: -1.14 to -0.20) and duration of pain (β= -0.13, 95% CI= -0.20 to -0.05) affected the psychological domain. Income (β= 14.94, 95% CI: 4.06 to 25.81) affected the social domain, while education (β= 9.96, 95% CI: 1.41 to 18.50) and disability (β= -0.75, 95% CI= -1.26 to -0.24) affected the environmental domain.

Conclusions: Our findings suggest that CLBP affects HRQoL and multiple socioeconomic and clinical factors influence its impact on different domains of HRQoL. Multipronged management programs, especially those that reduce disability could improve HRQoL in patients with CLBP.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- To the best of our knowledge, this is the first study in Cameroon to investigate HRQoL,in CLBP patients and to explore the determinants of specific HRQoL domains.
- We used a widely validated tool (WHOQOL-BREF) that allows for applicability across cultures and for comparisons between various settings.
- The absence of population norms for WHOQOL-BREF in Cameroon to serve as a reference limited our ability to establish relevant comparisons.
- We acknowledge that the cross-sectional design used in this study limits the establishment of causality in the associations identified.

INTRODUCTION

Low back pain (LBP) is an expanding health problem with a major impact on the general health and performance of populations worldwide. More than a third (38%) of the world's population suffer LBP in the course of a year [1, 2]. In 2017, LBP accounted for 850 Years Lived with Disability (YLD) per 100,000 population, and was the leading cause of disability globally [3]. On average, one in three adults in Africa have LBP. This was confirmed in a systematic review that reported a pooled adult prevalence of 32% and an average lifetime prevalence of 62% [4].

Cameroon is a lower-middle-income country in sub-Saharan Africa with a population of above 25 million [5] organized into 10 regions. The health system of the country consists of a public and private sector. The public sector which is the main health service provider is organized in a pyramidal manner under the control of the Ministry of Health and at its base 189 health districts. Health districts are primary care units made of several integrated health centres and a district hospital. Health care provision in these centres is largely ensured by nurses supported by doctors in a central district hospital. Specialist health services are generally localized within second-level facilities (regional hospitals) in each of the 10 administrative regions of the country. Tertiary hospitals are mainly located in the administrative (Yaounde) and economic (Douala) capital cities, and provide the highest level of specialized care. While little is known about the burden of LBP in primary care in Cameroon; it is the leading cause of specialist rheumatologic consultations [6, 7]. It equally causes considerable disability [8] and was considered the leading cause of YLD in 2017, with 652 YLD per 100,000 populations, increasing by 2% since 2015 [3].

Pain, muscle tension or stiffness, localized below the costal margin and above the inferior gluteal folds, with or without leg pain (sciatica) [9] is referred to as *acute LBP* when it lasts less than six weeks, *sub-acute LBP* when it lasts six to twelve weeks, and *chronic LBP* when

it lasts longer than twelve weeks [10]. Clinical and research emphasis is generally on chronic LBP because chronic pain is a recognized cause of reduced quality of life (QoL) [11].

QoL, a subjective concept, is defined in simple terms as a person's evaluation of his or her well-being and functioning in diverse domains of life [12]. The World Health Organization (WHO), defines QoL as an individual's perception of his or her position in life, in the context of the culture and value systems in which he or she lives, and in relation to his or her goals, expectations, standards, and concerns [13]. Health-related quality of life (HRQoL) though often used interchangeably with QoL [14], is considered by some as distinct or as a sub-concept of QoL [15, 16]. HRQoL pertains to an individual's evaluation of their experiences, and expectations in health-related aspects of their lives, notably; physical function, psychological well-being, subjective symptoms, social function and cognitive function [14, 15]. It is thought to equally extend to the individual's perception of health correlates like health risks, social support, sociocultural beliefs, and economic status [17].

The HRQoL of patients with CLBP (largely in non-African settings), has been explored and found to be reduced or sub-optimal [18–20]. Besides the obvious pain, multiple factors are implicated in this reduced HRQoL, some of which include; disability, fear of movement, impaired sleep quality, depression, anxiety, low income, low educational levels, lumbosacral radiculopathy and overweight/obesity [21–26]. Amongst these, disability (impaired physical function) is considered a core issue. Disability results in considerable work absence, lower productivity and poorer HRQoL [27–29].

The effect of CLBP on HRQoL has hitherto, not been investigated in the Cameroonian patient. Evidence of the possible contribution of unique demographic, clinical and socioeconomic factors in low-resource sub-Saharan African settings, and their influence on HRQoL in patients with CLBP is limited. In a bid to bridge this gap, we sought to assess HRQoL in Cameroonian CLBP patients using the World Health Organization Quality of Life

brief (WHOQOL-BREF) tool. We investigated the prevalence of perceived poor QoL, the prevalence of health dissatisfaction, and the factors associated with various domains of HRQoL in these patients.

MATERIALS AND METHODS

Study design and setting

A cross-sectional study was conducted from January to March 2017 at the Douala General Hospital (DGH). The DGH is a tertiary hospital that receives patients from all ten regions of Cameroon. The study was carried out at the rheumatology unit that has three consultant rheumatologists, who (on alternate days) run the outpatient consultations of the unit. Douala is a major city in the Littoral region and is the economic capital of Cameroon, with an estimated population of 2.7 million [30].

Patient and Public Involvement Statement

This research did not involve patients or public in the initial study design. However, patient representatives were invited to test the acceptability of two popular HRQoL measuring tools to determine which to use as principal outcome measure in our population (considering ease of understanding and time burden). Patients were again recruited to pretest the final questionnaire. Patients were not involved in the writing or editing of this document and were also not involved in the dissemination plans.

Sampling technique and study participants

The Cochran formula ($\mathbf{n = Z_{1-\alpha/2}^2 SD^2 / d^2}$) for calculating sample size required to estimate a variable mean was used**.** We set the confidence level to 95%, adopted a 5-point difference in the overall quality of life score (OQOL) of WHOQOL-BREF as our absolute error or precision and a standard deviation of 24.2 in the OQOL derived from a similar study in LBP

patients in Brazil in 2013 [27]. We obtained an estimated minimum sample size of 90 CLBP patients.

Consecutive sampling was used to recruit eligible and consenting adult patients aged 18 to 70 years. All patients presenting either de novo or for follow-up visits with complains of pain, muscle tension or stiffness, localized below the costal margin and above the inferior gluteal folds lasting no less than 12 weeks were considered. For clarity, the affected area of the body was shown in a human diagram. We excluded any patients who were pregnant, suspected to have cauda equina syndrome, or recent trauma. In addition, patients were excluded if they were unable to comprehend questions despite interviewer assistance. Figure 1 shows the flow diagram of participant selection leading to the final study sample.

Study procedures and data collection

Patients who fulfilled the study eligibility criteria and provided written informed consent were interviewed using a pre-tested structured questionnaire. Data collected were sociodemographic information, clinical data, as well as disability and quality of life assessment of participants. Questionnaires were available in English and French, the two official languages in Cameroon.

Sociodemographic characteristics:

Data on the following variables were collected; gender, age, marital status (single, married or widowed), employment status (employed, housewife, student, unemployed/retired), employment type (physical, non-physical), level of education (no education, primary, secondary and tertiary education), and average monthly income (< 50 000 FCFA, 50 000 - 100 000 FCFA, 100 000 - 300 000 FCFA, > 300 000 FCFA [1$US = 530FCFA]). Information on other characteristics like smoking status (current smoker, former smoker and non-smoker), alcohol use, and units of alcohol consumed per week (for consumers) were also obtained.

Clinical characteristics:

To clearly elucidate the duration of LBP, and cognizant of the remitting/recurring nature of LBP, the duration of pain was assessed in two ways. The total duration of LBP was recorded by asking participants the question; *"For how many years (months) have you had an ongoing low back pain problem?"*. This was adapted from the recommendations of the CLBP Research Task Force of the American National Institute of Health Pain Consortium [31]. Duration of their current pain episode was assessed by asking the question; *"How long (years/months) has it been since you went for a whole month without low back pain?"*, based on the definition of a LBP episode proposed by Vet et al. [32].

The assessment of pain intensity was done using the 100 mm visual analogue scale (VAS). Patients were asked to rate their pain level at the time of the interview. Other clinical data recorded included; leg pain, lower limb numbness/paresthesia (tingling, burning, electric-currents, numbness or "pins and needles" in the lower limbs), and bladder/bowel dysfunction symptoms (uncontrollable urges to urinate/stool, urine/stool leakages, or undue strain in stooling/initiating urine). In this study, we did not specifically identify the aetiology of these symptoms. In addition, the presence or absence of any comorbidity was documented. Patients' weight and height were measured and used to compute their body mass index (BMI). Seca® scales were used for weight measurement during which participants had to be without footwear and have on light clothing. For height measurement, the adult Leicester® stadiometer was placed against a wall, and participants (without shoes) stood upright while their heels and occiput were on the stadiometer. Measures were to the nearest 0.5 cm for height, and one decimal place for weight.

Assessment of disability:

The Roland Morris Disability Questionnaire (RMDQ), a subjective 24-item back pain-specific tool that assesses impairment in activities of daily living was used to assess disability. Responses to the 24 items were by either "yes" or "no", and a total score ranging from zero to 24 was generated by counting the number of "yes" responses (*yes* = 1 point and *no* = no point). Higher scores imply greater disability. The RMDQ is easily understood and available in validated English and French versions [33]. Work absence due to LBP was assessed in terms of *disability days,* which was defined as the number of days of restricted routine activity or work absence because of CLBP occurring within the 30 days preceding the interview.

Assessment of Health-Related Quality of Life (World Health Organization Quality of Life brief version– WHOQOL-BREF)

Most tools for measuring HRQoL are self-report questionnaires. The WHOQOL-BREF tool is a generic self-report HRQoL questionnaire (applicable to "healthy" and "sick" persons). It was developed using data from 15 countries including sub-Saharan African countries like Zambia and Zimbabwe. It is the brief version of the original one hundred item tool; WHOQOL-100. It is designed to be cross-culturally applicable and has been applied in clinical practice and research to measure health outcomes, monitor disease progress, and compare health states even across countries. In studies comparing generic HRQoL tools, WHOQOL-BREF was found to have good-to-excellent psychometric properties across disease states (especially in chronic disease) when compared with the most widely used of them all, the SF-36 [16, 34].

The WHOQOL-BREF tool consists of 26 items (questions/facets), 24 of which are divided into four domains: physical health domain (PHD), psychological domain (PSD), environmental domain (END), and social relationships domain (SRD). There are two separate

items evaluating the individual's satisfaction with state of health (general health score) and individual's perception of quality of life (overall quality of life score). Scores are organized such that higher scores imply better HRQoL. PHD explores activities of daily living, including dependence on medicines/medical aids, energy and fatigue, mobility, pain and discomfort, sleep and rest, and work capacity. PSD explores bodily image and appearance, negative feelings, positive feelings, self-esteem, spirituality/religion/personal beliefs, and thinking, learning, memory and concentration. SRD explores personal relationships, social support, and sexual activity. END explores financial resources, freedom, physical safety and security, accessibility and quality of health and social care, home environment, opportunities for acquiring new information and skills, participation in leisure activities, physical environment, pollution, noise, traffic and climate, and transport.

The WHOQOL-BREF questionnaire can be self-administered or interviewer-administered and responses are still valid allowing a 2-4 week period [35]. It was chosen due to its cross-cultural applicability, low administrative burden, sensitivity and responsiveness in chronic diseases states, and the availability of validated versions in Cameroon's national official languages (English and French). Each item of WHOQOL-BREF is scored on a 5-point likert scale. The item scores are then transformed into domain scores following the steps described in the WHOQOL-BREF manual [35]. While there are no established cut-off points for the WHOQOL-BREF domains to distinguish between "good" and "poor" HRQoL, two studies transformed the 2 individual items (general health score and overall quality of life score) into binary outcomes. In these studies, respondents with 2 points or less on a total of five (that is, rated their quality of life or health satisfaction as "poor" or "very poor"), were considered to have a poor outcome [20, 36].

Ethical considerations

Ethical approval to carry out the study was obtained from the University of Buea, Faculty of Health Sciences Institutional Review Board, with approval number: 2017/003/UB/SG/IRB/FHS. Written consent was obtained from all participants after careful explanation of the study scope and objectives. Strict anonymity and confidentiality were maintained during the handling of patient's records and response data. The study adhered to the World Medical Association's Declaration of Helsinki [37], and the study is reported in accordance with the STROBE guidelines.

Data management and statistical analysis

Data were cleaned and analyzed using the Statistical Package for Social Sciences (SPSS Inc, Chicago, Illinois, USA) version 20. Continuous variables were tested for normality using the Shapiro-Wilk's test. For ease of comparison, we report both the means with standard deviations, and the medians with 25th and 75th percentiles for all variables. Categorical variables were summarized using counts and percentages. The prevalence of poor overall quality of life (OQOL) and poor general health satisfaction (GHS) in CLBP was also estimated. Poor OQOL was considered as rating quality of life "poor" or "very poor" that is, cut-off scores of less than 3 points out of 5 of the original item score while moderate-to-good OQoL (≥ 3/5 points) for rating quality of life "neither poor nor good", "good" or "very good". Poor GHS (< 3/5 points), for rating satisfaction with health as "poor" or "very poor", and moderate-to-good GHS (≥ 3/5 points), patients rating satisfaction with health as "neither poor nor good", "good" or "very good".

GHS and OQOL scores were subsequently analyzed as continuous outcome variables. In bivariate analysis, Spearman's correlation coefficient was used to investigate associations of continuous independent variables with WHOQOL-BREF scores (PHD, PSD, END, SRD,

GHS and OQOL scores). In cases where WHOQOL-BREF scores were normally distributed we used analysis of variance (ANOVA) to explore differences in WHOQOL-BREF scores across categories, while for non-normally distributed data, we used the non-parametric Kruskal-Wallis test. Variables with a $p < 0.1$ in bivariate analysis were included in multivariable models. Because residuals were approximately normally distributed, we used multivariate linear regression models to determine factors independently associated with WHOQOL-BREF scores while adjusting for age, sex and other confounders. We checked for evidence of multicollinearity in the independent continuous variables via a correlation matrix and then ran collinearity diagnostics to assess their tolerance and variance inflation factor (VIF). All VIFs were less than two, suggesting absence of any multicollinearity. Statistical significance was set at $p < 0.05$.

RESULTS

One hundred and eighty potentially eligible patients CLBP patients (identified based on examination of patient's hospital records) were approached. They were screened via questioning to exclude pregnancy and trauma, and to confirm ability to understand questions. One hundred and fifty, who were confirmed eligible and provided consent, were included in study. However, only one hundred and thirty-six with complete WHOQOL-BREF questionnaires were used in the final analysis (Figure 1). The median (25^{th} to 75^{th} percentile) age of participants was 52 (43 – 60) years, with a female: male ratio of 1.8:1. Detailed characteristics of our study participants can be found in Figure 2 and Figure 3.

Pain and duration of CLBP

Overall, the median (25^{th} – 75^{th} percentile) duration of CLBP was 33 (12 - 78) months. The median duration of the ongoing pain episode was 12 (3 -24) months and the median perceived pain intensity score at the time of the interview was 40 (20 - 59) mm. Participants on average reported 6 ± 10 days of work loss in the previous month due to LBP (Table 1).

Health-related quality of life

All scores of the WHOQOL-BREF were not normally distributed with the exception of the END score which was normally distributed. The median OQOL score of CLBP patients at DGH was 50.0 (50.0 -75.0). The general health satisfaction score median was 25 (0 – 50), significantly lower than the OQOL score ($p < 0.001$). Amongst the four domain scores, the highest score was in the psychological domain, median: 62.5 (47.9 – 70.8). The lowest was the environmental domain median: 53.1 (40.6 – 62.5), see Table 1 for more details. Overall, 7.4 % had a poor perceived OQOL, while 64.7% had poor GHS.

Factors influencing HRQoL domains

Physical Health Domain: In univariate analysis (Tables 1 and 2), the factors significantly related to poor PHD included; longer days of work absence, higher disability scores, higher reported pain intensity, current smoking, documented radiologic disease, and primary or no formal education versus tertiary level education.

Table 1: Measures of central tendency, spread and correlations of variables with WHOQOL-BREF scores

	Mean ± SD	*Median*	*25th*	*75th*		*PHD*	*PSD*	*SRD*	*END*	*OQOL*	*GHS*
Age, years	50.6 ± 12.2	52.0	43.0	60.0	r_s	-0.14	-0.16˜	**-0.24**	-0.11	0.07	0.01
					P	0.113	0.069	**0.008**	0.226	0.442	0.875
Units of Alcohol per week	5.5 ± 11.7	0.8	0.0	6.5	r_s	0.11	-0.10	-0.14	-0.05	-0.07	0.00
					P	0.252	0.294	0.141	0.581	0.488	0.986
Overall duration of CLBP, months	62.7 ± 85.5	33.0	12.0	78.0	r_s	-0.07	-0.04	-0.10	-0.02	0.11	0.05
					P	0.452	0.611	0.160	0.837	0.223	0.577
Duration of pain episode, months	25.85 ± 45.2	12.0	3.0	24.0	r_s	-0.11	**-0.24**	-0.16	-0.13	0.04	0.01
					P	0.221	**0.005**	0.068	0.140	0.674	0.958
BMI in kg/m²	29.6 ± 5.7	28.7	26.0	33.5	r_s	0.00	-0.13	-0.10	-0.08	0.05	-0.05
					P	0.970	0.146	0.289	0.378	0.595	0.559
Days of work loss	6.0 ± 10.2	0.0	0.0	7.0	r_s	**-0.24**	-0.05	-0.10	-0.12	-0.12	-0.10
					P	**0.005**	0.544	0.264	0.177	0.150	0.230
RMDQ score	12.8 ± 6.1	13.0	7.0	18.0	r_s	**-0.34**	**-0.41**	**-0.26**	**-0.26**	-0.16	**-0.27**
					P	**0.000**	**0.000**	**0.002**	**0.002**	0.073	**0.002**
Pain Intensity	41.3 ± 24.3	40.0	20.0	59.0	r_s	**-0.19**	**-0.34**	-0.11	-0.16	**-0.20**	**-0.26**
					P	**0.031**	**0.000**	0.317	0.070	**0.024**	**0.002**
PHD Score	51.6 ± 10.5	53.6	44.6	57.1							
PSD Score	59.9 ± 15.7	62.5	47.9	70.8							
SRD Score	59.4 ± 20.5	58.3	50.0	75.0							
END Score	51.2 ± 16.0	53.1	40.6	62.5							
OQOL Score	59.6 ± 17.0	50.0	50.0	75.0							
GHS Score	31.4 ± 25.5	25.0	0.0	50.0							

Note: r_s = Spearman's correlation coefficient, SD = standard deviation, PHD = physical health domain, PSD = psychological domain, SRD = social relationship domain, END = environmental domain, OQOL = overall quality of life, GHS = general health satisfaction, CLBP = chronic low back pain, BMI = body mass index, RMDQ = Roland Morris Disability questionnaire.

Table 2: Univariate analysis showing differences in HRQoL domain scores across socio-demographic and clinical categories

	PHD				*PSD*				*SRD*				*END*	
	Median	***25th***	***75th***	***p***	***Median***	***25th***	***75th***	***p***	***Median***	***25th***	***75th***	***p***	***Mean ± SD***	***P***
Sociodemographic														
Gender				0.586				0.282				0.882		0.059
Male	53.6	42.9	57.1		66.7	47.9	75.0		66.7	50.0	75.0		54.6 ± 18.5	
Female	50.0	46.4	57.1		58.3	45.8	70.8		58.3	50.0	75.0		49.2 ± 14.3	
Marital Status				0.078				0.184				0.447		0208
Married	53.6	46.4	57.1		62.5	45.8	70.8		58.3	50.0	75.0		50.8 ± 16.8	
Single	57.1	48.2	60.7		66.7	56.3	75.0		66.7	50.0	75.0		55.3 ± 13.4	
Widow	44.6	41.1	53.6		56.3	45.8	64.6		66.7	45.8	79.2		45.5 ± 15.2	
Level of Education				**0.023**				**0.036**				**0.011**		**0.000**
Primary /no formal	**50.0[a]**	**42.9**	**57.1**		**58.3**	**45.8**	**70.8**		**50.0[a]**	**33.3**	**66.7**		**43.4 ± 14.4[a]**	
Secondary	**51.8**	**42.9**	**57.1**		**58.3[a]**	**41.7**	**70.8**		**58.3**	**41.7**	**75.0**		**50.3 ± 16.7**	
Tertiary	**57.1[b]**	**46.4**	**60.7**		**66.7[b]**	**54.2**	**75.0**		**66.7[b]**	**58.3**	**75.0**		**57.8 ± 13.7[b]**	
Employment status				0.293				0.069				0.226		0.423
Unemployed	50.0	42.9	57.1		56.3	45.8	62.5		54.2	33.3	58.3		44.4 ± 15.2	
Employed	53.6	46.4	60.7		66.7	50.0	75.0		66.7	50.0	75.0		52.1 ± 16.6	
Student	57.1	50.0	64.3		58.3	54.2	70.8		58.3	33.3	75.0		52.1 ± 11.0	
Housewife	50.0	46.4	57.1		58.3	50.0	62.5		58.3	41.7	66.7		48.3 ± 13.3	
Retired	42.9	39.3	57.1		50.0	37.5	62.5		66.7	50.0	75.0		55.6 ± 16.7	
Employment type				0.358				0.635				0.160		0.642
Physical	50.0	42.9	57.1		66.7	41.7	75.0		50.0	33.3	75.0		52.9 ± 17.7	
Non-physical	55.4	46.4	60.7		62.5	50.0	75.0		66.7	58.3	75.0		52.3 ± 15.7	
Combination	53.6	42.9	57.1		75.0	54.2	81.3		54.2	33.3	75.0		44.5 ± 25.6	
Income (thousand FCFA)				0.351				0.075				**0.008**		**0.022**
< 50	50.0	42.9	57.1		58.3	50.0	66.7		**58.3[a]**	**33.3**	**70.8**		**48.0 ± 14.5[a]**	
50 – 100	53.6	46.4	57.1		56.7	40.0	70.8		**66.7**	**50.0**	**75.0**		**46.4 ± 13.7**	
100 – 300	57.1	46.4	60.7		66.7	47.9	75.0		**66.7**	**58.3**	**79.2**		**54.5 ± 11.5**	
> 300	53.6	46.4	60.7		66.7	54.2	75.0		**66.7[b]**	**50.0**	**75.0**		**57.1 ± 20.6[b]**	
Alcohol Consumption				0.267				0.273				0.499		0.885
Non-consumer	53.6	41.7	57.1		58.3	45.8	66.7		66.7	33.3	83.3		51.6 ± 19.1	
Consumer	53.6	46.4	57.1		62.5	50.0	75.0		58.3	50.0	75.0		51.1 ± 15.3	
Smoking				**0.049**				0.298				0.704		0.193

Non-smoker	**53.6[a]**	**44.6**	**57.1**		62.5	47.9	70.8		62.5	50.0	75.0		50.6 ± 15.1	
Former	**57.1[a]**	**50.0**	**60.7**		66.7	54.2	75.0		58.3	41.7	66.7		56.1 ± 18.3	
Current	**35.7[b]**	**21.4**	**50.0**		58.3	37.5	62.5		50.0	16.7	83.3		41.2 ± 30.8	
Clinical														
Numbness or paraesthesia				0.389				0.088				0.179		0.079
Absent	53.6	46.4	57.1		66.7	54.2	75.0		66.7	50.0	75.0		53.7 ± 15.5	
Present	50.0	42.9	57.1		58.3	45.8	70.8		58.3	41.7	66.7		48.8 ± 16.3	
Sphincter dysfunction				0.074˜				0.075				**0.022**		**0.018**
Absent	53.6	46.4	60.7		62.5	54.2	75.0		**66.7**	**50.0**	**75.0**		**53.5 ± 14.8**	
Present	50.0	42.9	57.1		58.3	41.7	70.8		**58.3**	**33.3**	**75.0**		**46.7 ± 17.4**	
Leg pain				0.427				0.765				0.882		0.973
Absent	53.6	46.4	60.7		62.5	50.0	75.0		66.7	50.0	75.0		51.2 ± 15.8	
Present	53.6	42.9	57.1		62.5	45.8	70.8		58.3	41.7	75.0		51.3 ± 16.3	
Receiving treatment				0.745				0.635				0.120		0.790
No	51.8	50.0	57.1		62.5	45.8	70.8		66.7	50.0	75.0		52.1 ± 11.3	
Yes	53.6	42.9	57.1		62.5	50.0	75.0		58.3	41.7	75.0		51.1 ± 17.0	
Comorbidity				0.898				0.892				0.437		0.140
Absent	53.6	42.9	57.1		58.3	50.0	70.8		66.7	50.0	75.0		49.0 ± 15.6	
Present	50.0	46.4	57.1		62.5	45.8	75.0		58.3	50.0	66.7		53.1 ± 16.5	
Radiologic lesions				**0.036**				0.656				**0.041**		0.100
Present	**53.6**	**57.1**	**60.7**		60.4	55.0	75.0		**58.3**	**66.7**	**75.0**		49.2 ± 16.3	
Absent/ not requested	**57.1**	**42.9**	**60.7**		62.5	45.8	70.8		**75.0**	**41.7**	**75.0**		58.8 ± 18.8	

Note: SD = Standard deviation

˜ Mean or median differences non-significant, at < 0.1 level.

[a-b] Mean or medians in categories with unidentical superscript letters differ ($P < 0.05$), following post-hoc analysis.

In multivariate analysis, factors that independently influenced HRQoL in the physical domain included; current smoking (β = -20.49, p = 0.008), and documented radiologic disease (β = -7.57, p=0.036). The model explained 22.6% of the variance in the PHD scores (Table 3).

Psychological Domain: In the univariate analysis, factors associated with poorer HRQoL in the psychological domain were; the duration of a pain episode, higher RMDQ score, and secondary education when compared to tertiary education (reference category) (Table 1 and Table 2).

However only the RMDQ score (β = -0.67, p = 0.006) and the LBP episode (β = -0.13, p = 0.001) significantly influenced the PSD in multivariate analysis. The model explained 26.1% of the variance in the PSD scores (Table 3).

Social Relationships Domain: Lower SRD scores were associated with older age, sphincter dysfunction, documented radiologic lesions, primary education versus tertiary and an income below 50,000 FCFA versus one above 300 000 FCFA (Table 1 and Table 2).

In the multivariate model, the only independent predictor of SRD was income. Monthly incomes of 50 000 FCFA to 100 000 FCFA (β = 12.42, p = 0.044) and 100 000 FCFA to 300 000 FCFA (β = 14.94, p = 0.008) were associated with better SRD scores when compared with income below 50 000 FCFA. The model explained 13.4% of the variance in SRD scores (Table 3).

Environmental Domain: Univariate analysis revealed that lower END scores were associated with higher RMDQ scores, primary versus tertiary education, an income below 50,000 FCFA versus one above 300 000, and sphincter dysfunction (Table 1 and Table 2).

Factors independently associated with higher END scores were; tertiary level education (β = 9.96, p = 0.023) and RMDQ score (β = -0.75, p = 0.004). The model explained 15.4% of the variance in END scores (Table 3).

Table 3: Multivariate regression models showing factors independently associated with WHOQOL-BREF domain scores.

Physical Health domain (PHD) (aR^2 = 0.226)		β	95% CI
SOCIODEMOGRAPHIC			
Gender	Male	1	
	Female	1.29	-3.41, 5.99
Marital status	Married	1	
	Single	1.72	-4.45, 7.89
	Widow	-6.40	-14.0, 1.20
Level of Education	Primary/no formal	1	
	Secondary	-0.53	-5.68, 4.62
	Tertiary	-0.27	-5.71, 5.18
Smoking	Non-smoker	1	
	Former	5.92	-0.02, 11.87
	Current	**-20.49****	**-35.49, -5.48**
CLINICAL			
Sphincter Dysfunction	Absent	1	
	Present	-2.43	-6.75, 1.89
Radiological Lesion	Absent / not requested	1	
	Present	**-7.57***	**-14.64, -0.49**
Age, years		0.02	-0.18, 0.22
Work loss, days		-0.14	-0.35, 0.07
RMDQ score		-0.25	-0.67, 0.16
Pain intensity		-0.06	-0.17-0.04

Social Relationships domain (SRD) (aR^2 = 0.134)		β	95% CI
SOCIODEMOGRAPHIC			
Gender	Male	1	
	Female	5.59	-3.59, 14.78
Level of Education	Primary/no formal	1	
	Secondary	0.93	-9.24, 11.11
	Tertiary	5.61	-5.63, 16.86
Income (thousand FCFA)	< 50	1	
	50-100	**12.42***	**0.36, 24.49**

Psychological domain (PSD) (aR^2 = 0.261)		β	95% CI
SOCIODEMOGRAPHIC			
Gender	Male	1	
	Female	0.14	-6.14, 6.42
Level of Education	Primary/ no formal	1	
	Secondary	-5.71	-12.54, 1.13
	Tertiary	1.32	-6.64, 9.29
Employment status	Unemployed	1	
	Employed	2.47	-7.50, 12.45
	Student	7.63	-12.31, 27.57
	Housewife	4.56	-6.68, 15.79
	Retired	-3.92	-17.28, 9.44
Income (thousand FCFA)	< 50	1	
	50-100	-2.17	-11.17, 6.84
	100-300	0.88	-8.21, 9.96
	>300	4.10	-5.47, 13.66
CLINICAL			
Numbness/ Paraesthesia	Absent	1	
	Present	-2.06	-7.39, 3.28
Sphincter Dysfunction	Absent	1	
	Present	-1.44	-7.18, 4.30
Age, years		0.03	-0.24, 0.30
Duration of pain episode		**-0.13****	**-0.20, -0.05**
RMDQ score		**-0.67****	**-1.14, -0.20**
Pain intensity		-0.08	-0.20, 0.04

Environmental domain (END) (aR^2 = 0.154)		β	95% CI
SOCIODEMOGRAPHIC			
Gender	Male	1	
	Female	0.21	-6.42, 6.84
Level of Education	Primary/no formal	1	
	Secondary	4.80	-2.63, 12.22

	100-300	**14.94***	**4.06, 25.81**
	>300	9.26	-2.82, 21.35
CLINICAL			
Sphincter dysfunction	Absent	1	
	Present	-4.90	-12.98, 3.17
Radiological lesion	Absent/ not requested	1	
	Present	-8.27	-21.76, 5.21
Age, years		0.05	-0.31, 0.41
Duration of pain episode		0.04	-0.06, 0.14
RMDQ score		-0.59	-1.22, 0.05
Overall Quality of life (OQOL) (aR^2 = 0.129)			
		β	**95% CI**
SOCIODEMOGRAPHIC			
Gender	Male	1	
	Female	2.01	-4.89, 8.90
Level of Education	Primary/no formal	1	
	Secondary	5.39	-2.64, 13.41
	Tertiary	**11.43****	**3.12, 19.75**
Employment status	Unemployed	1	
	Employed	8.57	-1.28, 18.42
	Student	**23.07***	**0.28, 45.86**
	Housewife	14.87	-0.22, 29.96
	Retired	10.15	-5.35, 25.65
CLINICAL			
Numbness/Paraesthesia	Absent	1	
	Present	-6.22	-12.71, 0.26
Comorbidity	Absent	1	
	Present	1.75	-5.14, 8.63
Radiological lesion	Absent/ not requested	1	
	Present	-10.52	-21.45, 0.41
Age, years		**0.49***	**0.12, 0.87**
RMDQ score		-0.45	-1.06, 0.16
Pain intensity		-0.01	-0.17, 0.14
	Tertiary	**9.96***	**1.41, 18.50**
Income (thousand FCFA)	< 50	1	
	50-100	-2.09	-10.61, 6.44
	100-300	3.13	-5.04, 11.30
	>300	5.63	-3.12, 14.38
CLINICAL			
Numbness/ Paraesthesia	Absent	1	
	Present	-3.76	-9.50, 1.97
Sphincter dysfunction	Absent	1	
	Present	-3.01	-9.08, 3.07
Age, years		0.15	-0.11, 0.40
RMDQ score		**-0.75****	**-1.26, -0.24**
Pain intensity		0.09	-0.05, 0.22
General Health Satisfaction (GHS) (aR^2 = 0.188)			
		β	**95% CI**
SOCIODEMOGRAPHIC			
Gender	Male	1	
	Female	1.73	-8.15, 11.61
Employment type	Non-physical	1	
	Physical	**-14.57***	**-25.83, -3.31**
	Combination	14.98	-9.41, 39.37
CLINICAL			
Sphincter Dysfunction	Absent	1	
	Present	-5.73	-16.75,5.30
Age, years		**0.57***	**0.10, 1.04**
RMDQ score		-0.93	-1.88, 0.01
Pain intensity		-0.21	-0.45, 0.04

β = beta coefficient, CI = confidence interval. *** = Beta coefficient significant at < 0.001 level. **= Beta coefficient significant at < 0.01 level. * = Beta coefficient significant at < 0.05 level.

Overall Quality of Life and General Health Satisfaction: Higher perceived pain intensity was significantly associated with lower GHS and OQOL scores. Disability negatively influenced GHS but not OQOL. OQOL differed significantly in those with limb numbness/paraesthesia while the GHS score was significantly lower in those employed in physical effort requiring jobs compared to those who were not (Table 1 and Table 4).

In the multivariate analysis, tertiary education ($\beta = 11.43$, $p = 0.008$), increasing age ($\beta = 0.49$, $p = 0.010$) and being a student ($\beta = 23.07$, $p = 0.047$) were independently associated with OQOL. The model explained 12.9% of the variance in the OQOL score (Table 3). Amongst the domain scores, higher SRD scores ($\beta = 0.26$, $p = 0.001$) and END scores ($\beta = 0.43$, $p < 0.001$) were associated with better OQOL. The SRD and END explained 35% of the variance in the OQOL score after adjusting for age, gender, educational level and employment status (Table 5).

Based on multivariate analysis, variables independently associated with GHS were; age ($\beta = 0.57$, $p = 0.017$) and physical-type employment ($\beta = -14.57$, $p = 0.012$), with the model explaining 18.8% of the variance in GHS scores (Table 3). No domain score was significantly related to the GHS score in adjusted multivariate analysis (Table 5).

Table 4: Univariate analysis showing OQOL and GHS score differences across sociodemographic and clinical categories

	OQOL				*GHS*					*OQOL*				*GHS*			
	Median	***25th***	***75th***	***p***	***Median***	***25th***	***75th***	***p***		***Median***	***25th***	***75th***	***p***	***Median***	***25th***	***75th***	***P***
Gender				0.737				0.575	Alcohol use				0.154				0.497
Male	50.0	50.0	75.0		25.0	25.0	50.0		*Non-consumer*	75.0	50.0	75.0		25.0	0.0	75.0	
Female	50.0	50.0	75.0		25.0	0.0	50.0		*Consumer*	50.0	50.0	75.0		25.0	0.0	50.0	
Marital Status				0.301				0.422	Smoking				0.826				0.928
Married	50.0	50.0	75.0		25.0	0.0	50.0		*Non-smoker*	50.0	50.0	75.0		25.0	0.0	50.0	
Single	50.0	50.0	75.0		25.0	25.0	50.0		*Former*	50.0	50.0	75.0		25.0	25.0	50.0	
Widow	75.0	50.0	75.0		25.0	12.5	25.0		*Current*	50.0	50.0	75.0		25.0	0.0	50.0	
Level of Education				0.078˜				2.08	Numbness or paraesthesia				0.030*				0.191
Primary/ no formal	50.0	50.0	75.0		25.0	0.0	50.0	0.353	*Absent*	**50.0**	50.0	75.0		25.0	25.0	50.0	
Secondary	50.0	50.0	75.0		25.0	25.0	50.0		*Present*	**50.0**	50.0	75.0		25.0	0.0	50.0	
Tertiary	75.0	50.0	75.0		25.0	25.0	50.0		Sphincter dysfunction				0.105				0.061 ˜
Employment status				0.057˜				0.266	*Absent*	50.0	50.0	75.0		25.0	25.0	50.0	
Unemployed	50.0	50.0	50.0		25.0	0.0	50.0		*Present*	50.0	50.0	75.0		25.0	0.0	50.0	
Employed	50.0	50.0	75.0			25.0	50.0		Leg pain				0.714				0.319
Student	50.0	50.0	75.0		25.0	0.0	50.0		*Absent*	50.0	50.0	75.0		25.0	25.0	50.0	
Housewife	50.0	50.0	75.0		50.0	0.0	25.0		*Present*	50.0	50.0	75.0		25.0	0.0	50.0	
Retired	75.0	50.0	75.0		0.0	25.0	50.0		Receiving treatment				0.790				0.237
Employment type				0.979				**0.042***	*No*	50.0	50.0	75.0		37.5	25.0	50.0	
Physical	50.0	50.0	75.0		**25.0** [a]	0.0	25.0		*Yes*	50.0	50.0	75.0		25.0	0.0	50.0	
Non-physical	50.0	50.0	75.0		**50.0** [b]	25.0	50.0		Comorbidity				0.051˜				0.376
Combination	75.0	25.0	75.0		**25.0**	12.5	75.0		*Absent*	50.0	50.0	75.0		25.0	0.0	50.0	
Income (thousand FCFA)				0.122				0.713	*Present*	50.0	50.0	75.0		25.0	25.0	50.0	
< 50	50.0	50.0	75.0		25.0	0.0	50.0		Radiologic lesions				0.053˜				0.380
50 – 100	50.0	50.0	75.0		25.0	25.0	50.0		*Present*	75.0	50.0	75.0		25.0	0.0	25.0	
100 – 300	75.0	50.0	75.0		25.0	0.0	75.0		*Absent/ not requested*	50.0	50.0	75.0		25.0	25.0	50.0	
>300	62.5	50.0	75.0		25.0	25.0	50.0										

** = Median differences significant at <0.01 level.

* = Median differences significant at <0.05 level.

˜ = Median differences non-significant, at < 0.1 level.

[a-b] = Medians in categories with unidentical superscript letters differ ($P < 0.05$), following post-hoc analysis

Table 5: Multivariate regression model showing the influence of various domains on OQOL and GHS scores.

	OQOL $aR^2 = 0.350$		*GHS* $aR^2 = 0.151$	
	β	**95% CI**	**β**	**95% CI**
Physical health domain	-0.25	-0.54, 0.03	0.42	-0.15, 0.99
Psychological domain	0.10	-0.10, 0.30	0.36	-0.03, 0.74
Social relationships domain	**0.26****	**0.11, 0.41**	0.14	-0.17, 0.44
Environmental domain	**0.43*****	**0.22, 0.64**	-0.09	-0.51, 0.34

OQOL model adjusted for age, gender, educational level and employment status

GH model adjusted for age, gender and type of employment.

β = beta coefficient, CI = confidence interval

*** Beta coefficient significant at < 0.001 level.

** Beta coefficient significant at < 0.01 level.

* Beta coefficient significant at < 0.05 level.

DISCUSSION

Chronic pain is a recognized cause of reduced quality of life, but the dimensions and extent of the impact it has on HRQoL are subject to variations based on the individual, the disease, and even the environment. The aim of this study was therefore to describe HRQoL and its determinants in CLBP patients in Cameroon. Determinants of HRQoL differed for various WHOQOL-BREF component domains. Being a current smoker and having radiologic disease predicted poorer physical health, while increased disability (higher RMDQ scores) and longer LBP episodes predicted poorer psychological health. Higher income predicted better social relationships while higher levels of education and less disability (lower RMDQ scores) predicted better environmental health. Tertiary education, older age and being a student predicted better OQOL. On the other hand, older age and non-physical-type employment were associated with greater general health satisfaction.

The average OQOL score for CLBP patients in our study was about half of the maximum score. Similar scores were reported among other CLBP patients in countries with better living standards (higher per capita GDP) such as Brazil and Poland [27, 38–40]. While, in studies with a mixed population of acute and chronic LBP patients, higher average scores were reported [18, 19], strengthening the argument that CLBP has an impact on quality of life, and the chronic nature of the pain likely contributes to this effect [11].

The average general health satisfaction score for our CLBP patients was significantly lower than the average overall quality of life score, as was similarly reported in Polish patients [41]. More so, dissatisfaction with general health was common (more than two-thirds of our patients), while less than a tenth rated their quality of life as poor. In an Austrian study [20], though a similar disparity was observed between the two scores, health dissatisfaction was less common (about a quarter of their patients) than in our cohort. In addition, the proportion of persons in this study who rated their OQOL as “very bad” or “bad” was comparable to ours

(8.6% in men and 14.7% in women). This may be linked to the fact that patients in this study were recruited from the community (as opposed to hospital setting in our study) and possibly in better physical health states, hence more satisfied with their health comparatively. It could also be a reflection of better healthcare access and quality for the Austrian population in general. On the other hand, the consistent disparity between health satisfaction and self-rated overall quality of life appears to indicate that while CLBP clearly influences perceived health status, its effect on quality of life is seemingly not a direct one. Quality of life appears to be a broader indicator with multiple determinants.

Moving into the specific domain scores, the environmental domain score was the most impaired HRQoL domain in our patients. A similar finding was observed in Brazil [38]. However, the physical domain which was scored slightly better than the END by our patients (third most impaired domain) has been more commonly identified as most affected in similar patient groups in Iran, Austria, Brazil, Poland and Bosnia [18, 20, 27, 39, 42]. When consideration is given to the specific items (satisfaction with finances, physical security, accessibility of health care, quality of health/social care, home environment, participation in leisure activities, pollution, noise, traffic and transport) assessed in the END score, it is likely that the low scores found in our patients may reflect the comparatively low standards of living in our population, and limited infrastructure adapted for persons with disability.

The highest scored (least impaired) domains of HRQoL in our study were the psychological domain, followed by the social relationships domain. This order was rather uncommon in other literature. In most other LBP patient groups (Iran, Taiwan, Austria, Brazil, Poland and Bosnia) [18–20, 27, 38, 39, 41, 42], the SRD was the highest, with the PSD usually falling much lower in the third place. The PSD scores were reported to be most impaired (lowest) in two studies in Taiwan and Poland [19, 41]. We found this difference in perceived psychological wellbeing between our patients and those in other settings rather peculiar. We

speculate that it may be related to sociocultural particularities in our setting that could be further investigated.

There was no difference in HRQoL domain scores between males and female CLBP patients in our study, and in some others [18, 27]. One study however, reported better PSD scores in males with CLBP compared to females [42]. In a like manner, age did not affect any of the HRQoL domains in our patients, but findings in previous literature have thus far been variable. For example, in a cohort of CLBP patients in Brazil, older age was associated with poorer scores in all four domains [27]. In Bosnia, older patients had poorer PSD and PHD scores [42]. However, our findings are mirrored in a Polish study with similar mean age [39].

In some other studies pain intensity significantly influenced certain HRQoL domains [19, 39]. However, for ours, it had no significant influence on any HRQoL score after controlling for confounders. On the other hand, disability is also described in literature as a key predictor of lower quality of life in CLBP [19, 27, 41]. Disability in our patients was associated strongly with the PSD score, less so with the END, and not at all with the PHD after eliminating confounders, which is at variance with other reports [19, 27, 41]. In addition, this study found no relation between disability and perception of overall quality of life contrary to findings in Taiwanese and Polish cohorts [19, 41].

After controlling for age, sex, and other sociodemographic and clinical variables, being a current smoker and having documented radiologic lesions were the only factors independently associated with worse physical health scores. Smoking has been previously explored in Brazilian CLBP patients, but was found to have no influence on the PHD [27]. On examination of predictors of PSD, in addition to a strong relationship between disability and psychological quality of life, persons with a longer duration of their back-pain episode also had poorer PSD quality of life. Duration however did not influence any other HRQoL score. In a Polish cohort, duration of LBP rather influenced the END score [39].

In our study, tertiary education predicted better environmental quality of life while higher income predicted better social quality of life. Education equally seemed to play a role in perceived OQOL. Students and persons with university-level education had higher scores. Our results did not conform to previous reports [27, 39] in which educational level and income did not significantly influence any of the HRQoL scores after controlling for confounders. This could reflect the better socioeconomic equality of the population in these countries. Examining employment in more detail revealed that work type seems to influence health satisfaction in our CLBP patients and logically so. Subjects whose professional occupations involved physical exertion had significantly lower health satisfaction.

Environmental quality of life and social quality of life predicted patients' perception of their overall quality of life. A previous study rather discovered a relationship between OQOL and the physical and psychological domain scores [19]. These findings illustrate how factors unique to each population setting could influence HRQoL in identical disease states.

This study had certain limitations. Using a cross-sectional study design limited our ability to determine causality, as would have been possible with a prospective cohort design. In addition, our study was prone to selection bias owing to the use of a non-random sampling technique and the selected nature (hospital-based) of the study. Our findings cannot be generalized without caution as they likely reflect the situation at the study facility. Furthermore, we did not explicitly assess the aetiology of associated symptoms. We acknowledge that they may have been due to other health problems and not necessarily LBP. Finally, there is no culturally adapted, validated, generic HRQoL questionnaire specific for Cameroon. Furthermore, there are no population norms for WHOQOL-BREF in Cameroon. This lack of a reference limits our possibility to carefully analyze health outcomes.

However, we sought to reduce some of the bias by choosing a widely validated tool specially developed to be applied across cultures and permit comparisons across various settings.

Future research to develop a culturally adapted generic HRQoL tool for our setting and establish population norms of existing tools could go a long way to improving evaluation of the impact of CLBP on HRQoL.

Conclusions

Our results suggest that CLBP impedes the HRQoL of affected patients. The factors that influence HRQoL in CLBP patients vary across its various component domains. Multi-component management strategies, especially those that reduce disability and mitigate environmental and socioeconomic barriers to healthcare should be considered to improve the HRQoL in patients with CLBP. To the best of our knowledge, this study is the first of its kind in Cameroon to provide evidence on the health-related quality of life of patients with chronic low back pain, as well as the determinants of quality of life in this population. Our findings are thus relevant for health policy makers, as it has unearthed significant determinants that could be targeted in order to allay the burden of CLBP.

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Competing interests' statement

None declared.

Authors contributions

Study conception and design: JAA, LNA, MDB. Data collection: JAA, MDB, FKL, FMK. Statistical analysis: JAA and LNA. Drafting of manuscript: JAA and LNA. Critical review of manuscript: LNA, MDB, JAA, AMC, EVY.

Data availability statement

Deidentified participant data are available upon reasonable request from the corresponding author: jeannineatemanyingu@rocketmail.com; ORCID identifier: 0000-0003-3149-6494.

ABBREVIATIONS

LBP	Low back pain
CLBP	Chronic low back pain
YLD	Years lived with disability
QoL	Quality of life
HRQoL	Health-related quality of life
WHO	World Health Organization
WHOQOL-BREF	World Health Organization Quality of Life Brief
DGH	Douala General Hospital
VAS	Visual analogue scale
BMI	Body mass index
RMDQ	Roland Morris Disability Questionnaire
PHD	Physical health domain
PSD	Psychological domain
END	Environmental domain
SRD	Social relationships domain
OQOL	Overall quality of life
GHS	General health satisfaction
SPSS	Statistical Package for Social Sciences
VIF	Variance inflation factor
IQR	Interquartile range
SD	Standard deviation
CI	Confidence interval
GDP	Gross domestic product

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FIGURE LEGENDS

Figure 1: Derivation of final study population.

Figure 2: Description of socio-demographic characteristics of the study participants (N=136).

Figure 3: Description of the clinical characteristics of the study participants (N=136).

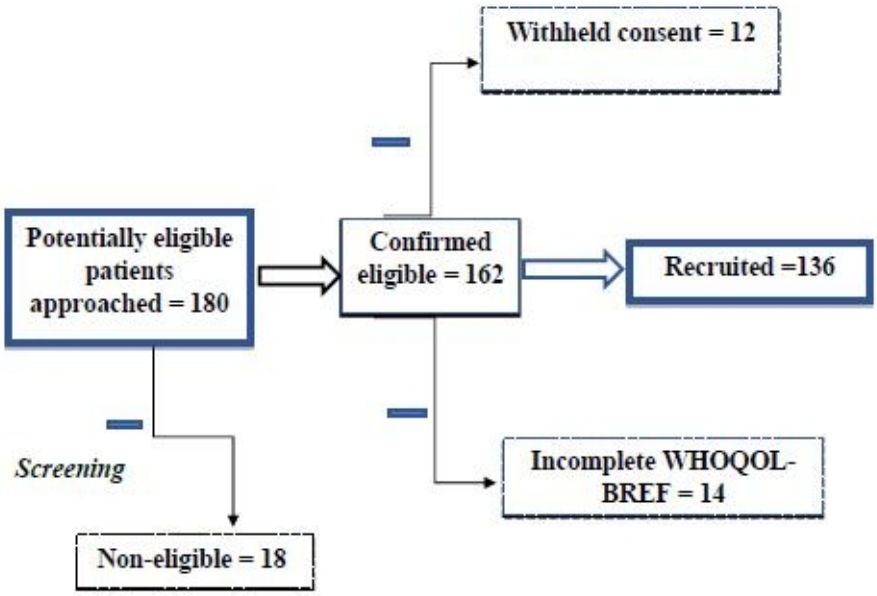

Figure 1: Derivation of final study population

Derivation of final study population.

44x33mm (300 x 300 DPI)

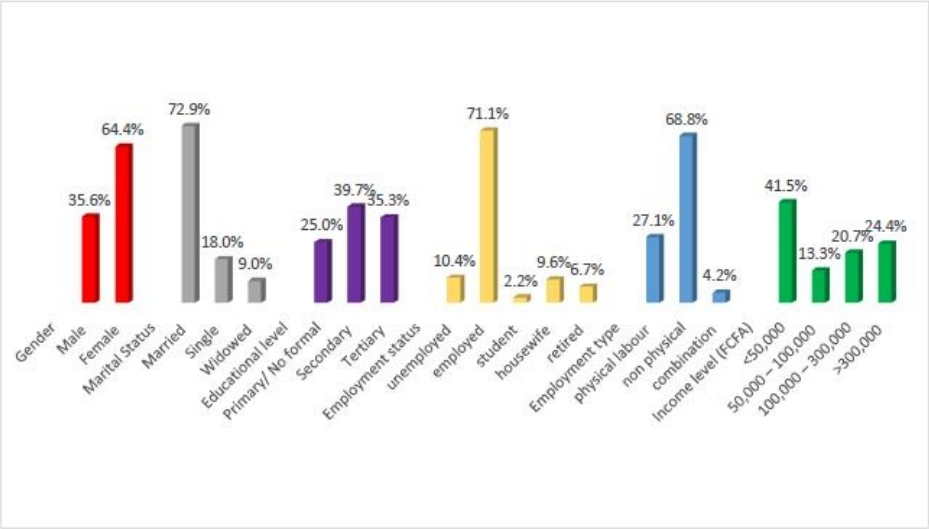

Figure 2: Description of the study participants: Socio-demographic characteristics (N=136)

Description of socio-demographic characteristics of the study participants (N=136).

58x39mm (300 x 300 DPI)

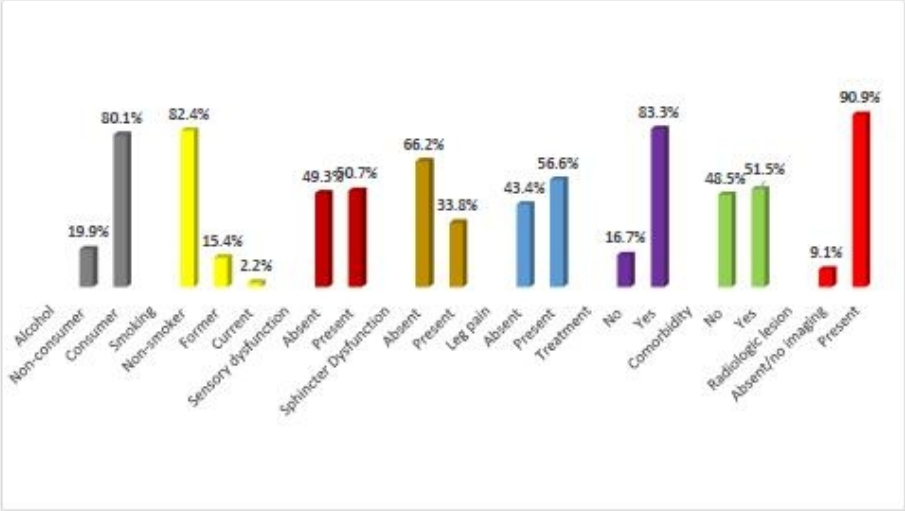

Figure 3: Description of the study participants: Clinical characteristics (N=136)

Description of the clinical characteristics of the study participants (N=136).

44x30mm (300 x 300 DPI)

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-6
Objectives	3	State specific objectives, including any prespecified hypotheses	5-6
Methods			
Study design	4	Present key elements of study design early in the paper	6
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	6
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7-10
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8-10
Bias	9	Describe any efforts to address potential sources of bias	6-7
Study size	10	Explain how the study size was arrived at	7, 10
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	11
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	10-11
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	10
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	13
		(b) Give reasons for non-participation at each stage	13
		(c) Consider use of a flow diagram	Figure 1
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	13, Figure 2
		(b) Indicate number of participants with missing data for each variable of interest	Figure 2
Outcome data	15*	Report numbers of outcome events or summary measures	13
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	13-15
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	11
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	16-19
Generalisability	21	Discuss the generalisability (external validity) of the study results	16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	2

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.