Strategies for improving the management of acute pain in households in Nakuru County, Kenya

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Background. The effective management of acute pain remains a challenge in many households, especially in resource-poor countries. In Kenya, healthcare-seeking behaviour associated with the management of acute pain has not been clearly documented.

Objective. To investigate strategies that are used to improve the management of acute pain in households in Nakuru County, Kenya.

Methods. A pretested questionnaire was used to collect data from 404 randomly selected households in Nakuru County, Kenya. The sampled households were surveyed three times: the first survey was to establish the prevalence of acute pain, and subsequent surveys assessed the effectiveness of treatment methods used by the patients. It was hypothesised that the interplay between the perception of pain, human capital, social capital and the burden of pain would be associated with effective management of acute pain. A logistic regression model utilising Gibbs sampling and data augmentation was used to establish factors that predict the use of effective healthcare services following the onset of acute pain.

Results. The mean (standard deviation) age of the respondents was 28.85 (10.30) years, and 53% were male. The prevalence of acute pain was estimated to be 51% (95% confidence interval 46 - 56). Effective management of acute pain was found to be related to perception of pain, with one additional unit of pain perception being associated with a 0.006 increase in effectiveness of management. In turn, pain perception was related to human capital, social capital and the burden of pain. Being male and membership of voluntary associations were negatively associated with pain perception. However, age and pain intensity had positive relationships with the perception of pain.

Conclusion. In order to effectively manage acute pain, the primary measure on which health educationists and policy planners should focus attention is enhancing pain perception. Such a policy option could be effected by a variety of techniques, including encouraging people to reduce the number of voluntary groups they belong to, or instead, by increasing general knowledge about pain among patients. Pain perception could also be affected by reducing patients' pain intensity.

Acute pain is a major health and socioeconomic problem in the world. It is estimated that 22% of primary care patients complain of acute pain.[1] In the USA, 80% of the estimated 99 million patients who undergo surgery annually report acute pain, and over 70% of annual emergency department visits are due to such pain.[2] Inadequately managed acute pain has major physiological, psychological, economic and social ramifications for patients, their families and society.[3] The economic impact of acute pain on the budgets of developing countries is yet to be estimated; however, it is thought that these budgets suffer considerable losses as a result of acute pain.[4] This underscores the need for aggressive control of acute pain, especially in resource-poor countries that have weak healthcare delivery systems.

Pain is usually defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage.[5] In research settings, pain is usually classified as either acute or chronic.[6] Acute pain is a normal response to tissue damage experienced during trauma, surgery or illness, rarely exceeds 3 months' duration and resolves during the healing process. Acute pain thus serves as a warning of tissue damage or danger. Owing to this important biological function, an understanding of the epidemiology of acute pain is of paramount importance. However, despite its significance, acute pain has not received commensurate attention in either the literature or treatment. This apathy is immense in resource-poor countries,[4] hence the need to redress this situation.

The conventional medical approach to managing pain is the use of analgesics and anti-inflammatory drugs, which are usually prescribed by clinicians. There are concerns, however, that many patients who require such drugs are not accessing them, whether for personal, legal, political, cultural or ethical reasons.[7] Patients suffering acute pain also seek help from other professionals, such as psychiatrists and counsellors. Patients are also known to engage in strategies such as indigenous knowledge-based medicine, and self-treatment. Empirical support for the effectiveness of such pain relief methods is, however, limited. If not managed effectively, acute pain may result in immune and metabolic problems, as well as leading to chronic pain syndromes.[8,9]

RESEARCH

Acute pain remains one of the most pressing challenges for households globally, particularly those in the developing world.[4] However, data on the prevalence of acute pain and factors that are associated with its effective management in the developing world are rarely assembled. This lack of data obscures the real impact and consequences of acute pain to individuals, households and economies. Therefore assembling data on the extent of acute pain is important since it has the potential to raise awareness about the magnitude of the problem. This study attempts to fill this gap in knowledge using household data collected in Nakuru County, Kenya.

Methods

Research setting

The cosmopolitan nature of Nakuru County offered an appropriate setting to investigate whether there are culturally diverse options for managing acute pain at the household level. The county is divided into 8 administrative divisions, which are in turn subdivided into 28 locations and 65 sub locations. The divisions provide a natural stratification of households in the county. Ngata division was randomly selected as the study site. Government data estimate that there are 3 040 households spread across the 10 locations of this division, with an average of 4.6 members per household.[10] Cartographic records for each of these locations were updated in the field at least 3 months before the actual study was conducted.

Research design

This was a longitudinal study that sought to establish factors that explain healthcare-seeking behaviour following acute pain in households in Nakuru County, Kenya. The data used in this article formed part of a larger PhD study. Respondents were recruited from among randomly selected households; those found to have at least one member suffering from acute pain (exposure) were followed for 6 months to measure healthcare-seeking behaviour (outcome). Data collection was done in three phases, at 3-month intervals: a baseline survey, and surveys 3 and 6 months later. The baseline survey was used to identify households with at least one member aged ≥18 years who had complaints of acute pain. This baseline survey was also used to collect demographic characteristics of household members. In households with at least one member suffering acute pain, the person was personally interviewed using a structured questionnaire twice more within the following 6 months, to ascertain the pain management options pursued.

Sampling procedure

The target population of the present study was all 3 040 households in Ngata Division of Nakuru County. A sampling list of the households in the study site was constructed, where each household was given a unique identification number. This list was used to select the study sample. The minimum sample size was established using the formula described by Hedeker *et al.*,[11] with the assumptions of an alpha value of 0.05 at 95% confidence interval, a power of 80%, 3-time intervals, a correlational coefficient of 0.7 and an attrition rate of 5%, giving a minimum sample size of n=396 households. Using the Kish[12] grid method, one individual was selected at random from each of the sampled households. A total of 420 households

was therefore visited, and a total sample of 404 participants agreed to be interviewed.

Measurement of variables

The dependent variable in this study was whether an effective healthcare option was used to manage acute pain by the study respondents. This involved assessing whether patients considered their acute pain to have been managed effectively by the healthcare options they used following its onset. Patients who indicated that the healthcare option(s) used were effective were scored 1; otherwise, 0.

Four sets of independent variables were assessed, namely, human capital, social capital, characteristics of pain and pain perception. The sociodemographic characteristics of the survey respondents made up the components of general human capital. This was assessed using the age, sex, educational attainment and socioeconomic class of the respondents. Social capital was measured using items selected from World Bank Integrated Questionnaire for the Measurement of Social Capital (SC-IQ).[13] The items assessed the prevalence of groups and networks, and the utilisation of trust, solidarity and reciprocity among the study participants.

The short-form McGill Pain Questionnaire (SF-MPQ-2),[14] which incorporates a series of questions on the characteristics and intensity of pain, was used to assess the nature of pain. This is the most widely used pain measurement scale, and its psychometric properties are well established.[15]

Pain perception was assessed in five dimensions: (*i*) identity – the label the person uses to describe the illness and the symptoms that they view as being part of the disease; (*ii*) consequences – the expected effects and outcome of the illness; (*iii*) cause – personal ideas about the cause of the illness; (*iv*) timeline – how long the patient believes that the illness will last; and (*v*) cure or control – the extent to which the patient believes that they can recover from or control the illness. The respondents were asked to circle the number that corresponded to their views on each item of the knowledge dimensions, on a scale of 1 (least agreement) to 10 (total agreement). A pain perception index for each respondent was calculated by adding the individual item scores. This index of the dimensions of pain was generated through a careful scale development strategy (literature review, expert interviews, formulation of a pre-version, application and statistical analyses such as factor, item and reliability analyses, scale improvement and additional application and analyses).

All the measures of interest were then complied into a structured questionnaire. This questionnaire was pilot-tested in 40 households in the study area prior to the final survey. These households were not included in the final sample.

Data were collected by means of interviews conducted with at least one recruited member of each selected household. The pre-tested questionnaires were administered by the researcher with the help of three trained research assistants.

Data analysis

Data were initially cleaned, counter-checked for accuracy and then entered into a computer using Excel (Microsoft, USA). The created

data file was then imported into WinBUGS Release 14 (Windows Bayesian Inferences Using Gibbs Sampling; the BUGS Project, UK) software, which was used for data analysis.

Data were initially summarised using frequencies, percentages, means and standard deviations (SDs), and presented using contingency tables. Likert-type questions were subjected to factor analysis. The numerical variables in the survey were then subjected to correlation analysis.

The determinants of effective management of acute pain were subjected to a logistic regression model, and the correlates of perception of pain were established using a multiple linear regression model. Both models were estimated from a Bayesian paradigm, using a statistical model that exploits Gibbs sampling and data augmentation to make inferences. The procedures for conducting these estimations are well described in the literature,[15] and in this study they were executed in WinBUGs.

Ethical considerations

Initial clearance to conduct the present study was sought from Jomo Kenyatta University of Agriculture and Technology. Approval to conduct the research was sought from the Scientific Steering Committee (SCC) and ethical clearance was obtained from the Kenya Medical Research Institute (KEMRI)/National Ethics Clearance Committee (ref. no. 1960). Voluntary informed consent was also obtained from the study respondents.

Patient data were held in strict confidentiality. Households were identified in the study using codes to ensure privacy. The rights to privacy as enshrined in Kenyan legislation regarding medical research and the Helsinki Declaration were adhered to. Patients with high levels of pain that could not be managed at home (present pain intensity (PPI) ≥4 using the SF-MPQ-2) were advised to seek attention in appropriate health facilities.

Results

In the baseline survey, 404 respondents were sampled, 53% men and 47% women. The mean (SD) age of the respondents was 28.85 (10.30) years; the youngest was 18 years old, while the oldest was 84. Forty-six percent of respondents indicated that they were married, and 44% had at least college-level education. Using the expenditure approach, 57% of the sampled respondents indicated that they were of low socioeconomic status, 31% were middle class and 12% in the high-expenditure bracket.

The prevalence of acute pain was 51% of the 404 studied respondents (95% confidence interval (CI) 46% - 56%) in the study area (Table 1). The node statistics table lists the mean (SD) of the posterior distribution of the monitored quantity, θ, as well as its median and the 95% CI.

Table 1. Prevalence of acute pain: Posterior moments and quantiles (*N*=404)

Pain type	Mean (SD)	Median	95% CI
Acute	0.51 (0.024)	0.51	0.46 - 0.56
Chronic	0.11 (0.016)	0.11	0.08 - 0.14
None	0.38 (0.024)	0.38	0.33 - 0.43

SD = standard deviation; CI = confidence interval.

A pain rating index (PRI) was calculated by adding up the intensity rank values of all words chosen to describe different kinds of pain using SF-MPQ-2. The descriptive statistics of the PRI among the surveyed acute pain sufferers, and its individual items, are shown in Table 2. The mean PRI was 6.16 (SD = 6.04). The item means of individual items in the PRI ranged from 0.02 (pain caused by light touch) to 1.02 (throbbing).

In addition, pain intensity was measured using the PPI scale. This is a verbal analogue scale (VAS) with values from 0 (no pain) to 5 (excruciating). The mean (SD) PPI on a scale of 0 - 5 was 1.92 (1.02). The PRI and the PPI were highly correlated (Spearman's rho = 0.20, $p<0.05$). This may be an indicator of the concurrent validity of these two measures of the intensity of pain.

Of the respondents suffering from acute pain, 59% stated that they were members of at least one voluntary group. The surveyed acute pain sufferers were members of a mean (SD) of 1.35 (1.34) groups. The density of membership was not normally distributed (skewness = 1.99, standard error = 0.17). The median number of groups per respondent was 1 (25th = 0; 75th = 2 percentiles).

The descriptive statistics of respondents' ratings of the seven items used to assess perception of pain are shown in Table 3. Respondents gave the dimension of treatment control the highest mean (SD) rating of 6.17 (3.70), while the timeline dimension was rated lowest, at a mean (SD) score of 2.11 (2.01). The table also

Table 2. Descriptive statistics of SF-MPQ-2 items and pain severity scores of the respondents

SF-MPQ-2 item	Pain severity score		
	Mean (SD)	Skewness	Kurtosis
Throbbing	1.02 (2.19)	1.96	2.35
Shooting	0.56 (1.70)	3.84	15.99
Stabbing	0.25 (1.29)	6.09	39.27
Sharp	0.94 (2.29)	2.57	5.89
Cramping	0.46 (1.56)	3.67	13.55
Gnawing	0.24 (1.24)	5.29	27.30
Hot/burning	0.38 (1.45)	3.91	14.48
Aching	0.66 (1.86)	2.77	6.51
Heavy	0.20 (1.14)	5.82	33.54
Tender	0.10 (0.61)	6.68	45.94
Splitting	0.19 (1.11)	6.21	38.09
Tiring/exhausting	0.14 (0.89)	6.97	50.28
Sickening	0.23 (1.04)	5.13	27.47
Fearful	0.05 (0.53)	11.87	147.86
Punishing/cruel	0.12 (0.82)	8.14	70.00
Electric shock	0.05 (0.41)	8.34	69.85
Cold-freezing	0.21 (1.09)	5.40	29.02
Piercing	0.08 (0.57)	8.26	73.67
Pain caused by light touch	0.02 (0.28)	14.21	202.00
Itching	0.09 (0.64)	7.50	58.42
Tingling or 'pins and needles'	0.09 (0.65)	7.56	58.25
Numbness	0.06 (0.61)	10.19	106.45
SF-MPQ-2 22-item PRI	6.16 (6.04)	3.62	18.55
PPI	1.92 (1.02)	0.46	−0.08

SF-MPQ-2 = short-form McGill Pain Questionnaire; SD = standard deviation; PRI = pain rating index; PPI = present pain intensity.

Table 3. Descriptive statistics and correlation coefficients on respondents' perception of pain

Pain assessment item	Mean (SD)	1	2	3	4	5	6	7	8
					Rating				
1. Consequences	3.17 (3.07)	1							
2. Timeline	2.11 (2.01)	0.40*	1						
3. Personal control	5.28 (3.62)	0.03	−0.16†	1					
4. Treatment control	6.17 (3.70)	0.27*	−0.01	0.65*	1				
5. Identity	3.25 (3.07)	0.63*	0.39*	0.06	0.30*	1			
6. Concern	4.88 (3.73)	0.51*	0.25*	0.35*	0.43*	0.47*	1		
7. Emotions	3.09 (3.15)	0.61*	0.31*	0.08	0.25*	0.57*	0.47*	1	
8. Comprehensibility	5.26 (3.74)	0.19*	−0.03	0.51*	0.54*	0.23*	0.47*	0.27*	1

*Correlation is significant at the 0.01 level (two-tailed). †Correlation is significant at the 0.05 level (two-tailed).

includes the correlation coefficients of all seven dimensions of the respondents' ratings of the pain perception items.

The table also presents the results of the item that assessed the comprehensibility of pain. Comprehensibility was rated by the respondents at a mean (SD) of 5.26 (3.74), and was significantly correlated with all but one of the dimensions of perception of pain, namely, the timeline.

A pain perception score (PPS) was calculated by adding up the seven dimensions of pain and dividing by seven. This scale showed good internal consistency (α=0.77), and there was no damage to its internal consistency if any of the individual items were removed. There was substantial variation in this 7-item scale, with the mean scores ranging from 0 to 8.29, on an 11-point (0 - 10) scale. The surveyed respondents had a mean (SD) per-item score of 3.99 (2.14) on the 7-item scale.

The results show that only 24% (50/206) of respondents suffering from acute pain had sought medical attention from formal medical institutions, which included the provincial general hospital, dispensaries and private hospitals and referral hospitals. The remaining 76% had not sought formal medical attention outside the home. Of these, 71% indicated that they were using conventional medicine, 11% used indigenous knowledge-based methods, 9% used other alternative methods and the remaining 9% took no action.

The present study hypothesised that the interplay of human capital, burden of pain and social capital would lead to improved pain perception, which in turn affects choice of effective pain management options. A logistic regression model was used to investigate the simultaneous effects of sociodemographic, burden-of-pain, social capital and perception-of-pain variables on the effectiveness of managing acute pain. Variables were entered using the backward stepwise elimination method. The results are reported in Table 4. The model had satisfactory properties, for example, it predicted 80% of the cases correctly. Perception of pain was positively associated with effective management of pain at home, with one additional unit of pain perception being associated with a 0.006 increase in effectiveness. Occupancy, however had a negative influence on effectiveness, with each additional year of stay in the location being associated with a reduction of 0.016 on effectiveness in managing acute pain at home.

The correlates of perception of pain were determined next. The regression coefficients obtained by using stepwise regression

Table 4. Estimation results of a logistic regression model for factors influencing effective management of pain among the respondents

Factor	Mean (SD)	2.5%	97.5%
Constant	0.484 (0.106)	0.278	0.687
Pain perception	0.006 (0.002)	0.002	0.009
Occupancy	−0.016 (0.004)	−0.024	−0.008

SD = standard deviation.

Table 5. Results of regression analysis of factors affecting pain perception

Factor	Mean (SD)		2.50	97.50
Constant	46.16	6.16	34.12	58.26
Sex (male)	−7.50	2.15	−11.74	−3.28
Pain intensity	2.47	1.11	0.26	4.65
Diversity (network)	−1.85	0.37	−2.66	−1.12
Help (neighbour)	−2.46	0.94	−4.29	−0.61
Age	0.26	0.12	0.02	0.50

SD = standard deviation.

testing are shown in Table 5. The reported results are all significant at $p<0.05$. Each of the reported covariates had a significant impact on perception of pain. Focusing on the parameter estimates themselves, male sex is associated with a 7.50 decline in score of perception of pain. Further, the addition of one unit in pain intensity is associated with a 2.47 increase in PPS. Group diversity is inversely associated with the perception of pain, with the more diversified the membership of a group, the lower the PPS. The likelihood of getting help from close neighbours is negatively associated with PPS, with a 1-unit increase in likelihood of obtaining help being associated with a 2.46 decline in PPS. Age is positively associated with PPS, with a 1-year increase in life associated with a 0.26 increase in PPS.

Discussion

A 51% prevalence of acute pain was estimated in the study site. This is a fairly high figure in a population-based study, which suggests that acute pain is a major health problem among the study population.

The surveyed population used a variety of health options to manage acute pain, which ranged from self-medication, alternative medicine and indigenous knowledge to visits to a variety of medical

institutions. The use of both ethnomedicine and biomedicine during the same episode of illness is widely practised in the developing world.[16] It is therefore likely that there exist within the study site differently designed and conceived medical systems, in regard to the management of acute pain. It can therefore be argued that the study respondents see medical systems as either complementary or supplementary, and not competing.

The results show that most respondents suffering from acute pain were engaged in self-medication. The use of conventional medicine was the most popular, followed at a distant second by indigenous knowledge-based methods, then other alternative methods, and simply taking no action, in that order. This supports the literature that has documented the prevalence of self-treatment among patients in resource-poor countries.[4,17] This is a dangerous trend that may lead to resistant drugs and drug addiction.

The results also show that a high proportion of the surveyed respondents considered that the health option that they used to manage acute pain at home was effective. This was regardless of whether formal or informal methods of managing acute pain were used. Literature for the purposes of comparison with this result is not readily available; however, extant literature suggests that people usually perceive their actions favourably.[18]

The results indicate that social capital in the form of group diversity and obtaining help from neighbours was negatively associated with perception of pain. This result contradicts the literature, which argues that social capital helps to transmits knowledge.[19] Social capital is discussed in the literature as either the resources (such as information, ideas, support) that individuals are able to procure by virtue of their relationships with other people, or the nature and extent of one's involvement in various informal networks and formal civic organisations.[13] The negative relationship observed in this study may be explained by the observation that the available groups and networks are deficient in requisite resources. The effects of social capital on pain perception deserve deeper empirical reflection.

Men were found to have lower PPSs than women. This finding is not surprising since men are known to tolerate pain and sickness.[20] Following social norms of not being able to overtly show pain or emotion (such as fear about an illness) hinders men from feeling psychological relief or manifesting it in the medical encounter. It has also been suggested that men tend to report lower intensities of pain than women.[2] Men should be encouraged to be more open about pain in order to prevent the adverse outcomes that are associated with acute pain.

Age was found to be positively associated with the perception of pain. This may be explained by the fact that advanced age is associated with more frequent episodes of pain, which leads to enhanced understanding of pain. Thus age fosters the development of the appropriate skills and attitude. It is therefore reasonable to expect that age contributes to human capital. Age is usually correlated with experience. Experience also translates into valuable episodic knowledge, and is thus a direct source of knowledge. Previous experience with health-related activities provides individuals with a variety of resources that can be utilised in managing subsequent healthcare needs.[21] Previous experience

can be used to enhance individual skills that can help to influence the reallocation of resources in subsequent healthcare needs.

A key result in this study was that pain intensity was correlated with pain perception. The burden of pain has been identified in the literature as an important predictor of healthcare-seeking behaviour. The overall burden of pain consists of the duration and the intensity of pain. Overall, perceptions of the severity of an illness have been associated with effective healthcare-seeking behaviour.[22]

Respondents with higher PPSs had effectively controlled acute pain. This result agrees with the literature that supports the role of knowledge in overcoming challenges.[23] It also supports the conceptual framework advanced in this study: that pain perception is an immediate determinant of effective management of acute pain. Enhanced knowledge of a phenomenon leads to better handling of the same.

Respondents who had lived in the study area for a longer amount of time were found to have a lower perception of acute pain. This is not easily explained, but one cannot rule out spillover effects. It appears that people who moved to the study area earlier share a common culture that prevents them from effectively managing acute pain.

Conclusion

The policy-relevant variable having the greatest impact on managing acute pain effectively is enhanced perception of pain. Such a policy option could be effected by a variety of techniques, including encouraging patients to reduce the number of voluntary groups they belong to, or instead, by improving patients' general healthcare-related knowledge. Pain perception could also be effected by reducing patients' intensity of pain.

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