

# Occupational risk factors of Low Back Pain among tea pickers and non-tea pickers in James Finlay (K) Ltd, Kericho County, Kenya

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## Abstract

Low back pain (LBP) is a major public health problem in the world. It is estimated that 60% of all employees experience LBP at some point in their life during their employment career. It is also the most prevalent musculo-skeletal condition in rural communities in Kenya and it is estimated that 64% of the tea pickers are suffering from LBP in Kenya, of these, 29% had a history of back pain before they started picking tea. The study aimed at determining the prevalence and assessing the occupational risk factors of LBP among tea pickers and non-tea pickers in James Finlay (K) Limited tea estates in Kericho County. Data were collected using structured questionnaires. Bivariate, multivariate analysis and Pearson's chi square ( $\chi^2$ ) test was used to measure the associations. This study was a cross-sectional comparative study that sampled 454 adults (335 tea pickers and 119 non-tea pickers). The prevalence of LBP was found to be 45.4% (125/335) and 39.5% (47/119) among tea pickers and non-tea pickers respectively. The following characteristics were significant at bivariate level including age, parity and duration of work were found to be related to LBP among tea pickers and non-tea pickers ( $\chi^2=8.643$ ;  $P=0.034$  and  $\chi^2=6.013$ ;  $p=0.049$ ) respectively. However, the number of hours worked per day was significantly associated with LBP among tea pickers only ( $\chi^2=17.192$ ;  $p=0.000$ ). Further, the number of kilograms of tea leaves picked and the number of kgs carried per day was also significantly associated with LBP ( $\chi^2=16.882$ ;  $p=0.000$  and  $\chi^2=15.978$ ;  $p=0.001$ ) respectively. There was also a significant association of LBP with carrying of heavy load and how one sharpened farm tools among the non tea pickers who reported to have suffered LBP ( $\chi^2=13.129$ ;  $p=0.000$  and  $\chi^2=4.125$ ;  $p=0.042$ ) respectively. However, age ( $p=0.0022$ ; 95% CI -9.4-7); absenteeism from work ( $P=0.010$ ; 95% CI 2.7-19.5), work duration per day ( $P=0.000$ ; 95% CI 23.1-38.5), type of occupation ( $P=0.000$ ; 95% CI 62.2-79.3) and the no. of Kgs ( $P=0.011$ ; 95% CI -17.8-2.3) carried were found to contribute independently to LBP among tea pickers whereas absenteeism from work ( $P=0.000$ ; 95% CI 11.9-29.1), work duration per day ( $P=0.000$ ; 95% CI 69.8-86.8), alcohol uptake ( $P=0.008$ ; 95% CI 3.2-20.7), heavy load carried ( $P=0.018$ ; 95% CI 1.8-18.2) and work duration ( $P=0.002$ ; 95% CI -14.3-3.2) among non-tea pickers were also found to contribute independently to LBP. The prevalence of LBP was found to be high among both tea and non-tea pickers. We recommend that there is need to consider reviewing tea picking policies for instance introduction of tea picking devices in order to alleviate occupational health hazards associated with tea picking.

**Key words:** Low Back Pain, tea pickers, non-tea pickers.

## 1. Background

Low Back Pain (LBP) is a major health problem in the world (Van Tulder *et al.*, 2006), it is estimated that 60% of all employees experience LBP at some point in their life during their employment career (Anderson *et al.*, 1991). Majority of LBP incidences occur during the working ages of 20-55 years. However, the first incidences occur between the ages of 20 to 40 (Mirabile and Simons, 1972). A Kenyan study reported that 64% of tea pickers suffered from back pain during their employment, 29% of these had a history of back pain before starting tea picking. This means that about 35% have developed back pain solely due to occupational exposure to the musculoskeletal hazards of tea picking (Muruka, 1999). LBP is the most prevalent musculoskeletal condition in rural communities over-represented in low-skilled, manual jobs and the community service sector and one of the

most common causes of disability in the developed nations. Anecdotally, there is a general assumption that LBP prevalence in Africa is comparatively lower than in developed countries (Boreham *et al.*, 1993).

Occupational injury is recognized as the leading cause of occupational LBP in developed and developing countries (Battie and Bigos, 1991). Further, occupational back pain in industry is a major problem with prevalence of back pain in the working population varying from 12-14% depending on the profession with a mean prevalence of 27% in the Netherlands. Previous history of LBP is often predictive of future back pain problems and chronic cases represent a significant burden on the healthcare and compensation systems. Both psychological and physical factors related to work have found to be associated with LBP in many cross-sectional and some longitudinal studies (Bongers *et al.*, 1993).

Moreover, a third of all the disability costs in the United States are due to LBP disorders (Bratton, 1999). For instance, it is estimated that the direct Health care cost for LBP in the US is \$20 billion annually. This amount increases to \$50 billion annually when one includes the indirect costs (Patel *et al.*, 2000). The latter refers to the cost to the economy in terms of lost work hours and loss of productivity due to absenteeism from work. The situation is no better in Canada where the treatment cost of musculoskeletal disorders is similar to the cost of cancer related diseases. There is an abundance of literature reports on the risk factors of LBP in the general population (Haldeman, 2005). Known modifiable risk factors for LBP include; lack of fitness, poor health, obesity, smoking, drug dependence, and occupational factors including heavy lifting, twisting, bending, stooping, awkward posture at work and prolonged sitting. Those that are non-modifiable are increasing age, number of children, a previous episode of LBP and major scoliosis (Dwyer, 1987). It is within the public health interest to prevent injuries and painful conditions by addressing modifiable risk factors for LBP. The study aimed at determining the prevalence and assessing the occupational risk factors of LBP among tea pickers and non-tea pickers in tea estates of James Finlay (K) Limited (JFK) in Kericho County.

## 2. Materials and Methods

The present study was a cross-sectional comparative study that utilized quantitative data collection techniques. It was conducted at JF (K) Limited tea estates in Kericho County. The County is located to the South West of the Republic of Kenya and lies within the highlands of Rift Valley. Prior to the study, approval was granted by KEMRI National Review Board (SSC NO. 2564) and JF (K) head office. The study population included tea pickers and non-tea pickers aged 18 years and above working in JF (K) Limited tea estates. A minimum sample size of 454 was calculated (both males and females). Stratified sampling procedure was used whereby each estate was divided into strata, followed by random sampling of individuals in each stratum. Written informed consents were obtained and the purpose of the study was explained to the participants by trained interviewers. The data regarding demographic characteristics and risk factors of LBP were collected using structured questionnaires. After the collection of data, it was entered and analyzed using SPSS version 19.0.

Descriptive statistics were used in analysis to give proportions and frequencies. Bivariate analysis, Pearson's chi square ( $\chi^2$ ) tests were used to determine the association between diagnosis of LBP and socio-demographic characteristics and risk factors. Multivariate analysis was done on variables that were significant at bivariate level in order to determine the variables that independently contribute to LBP suffering. Level of significance at  $P \leq 0.05$  was considered.

## 3. Results

### Baseline characteristics of tea and non-tea pickers

A summary of socio-demographic characteristics is shown on (table 1). A total of 454 participants aged 18-49 years were enrolled, 73.8% (335/454) were tea pickers with a mean age of  $36.4 \pm 1.03$  and 26.2% (119/454) were non-tea pickers with a mean age of  $37.3 \pm 1.8$ . Most tea pickers were aged 26-33 years representing a 38.5% while majority of non-tea pickers were aged 34-41 years at 52.1%. More than half of tea pickers 65.4% were males while 54.6% of same genders were non-tea pickers. In terms of marital status, respondents who were married constituted the largest proportion for both tea pickers and non-tea pickers at 85.7% and 91.6% respectively. Majority of the respondents had more than two children between the two study populations groups at 56.1% for tea pickers and 64.7% for the non tea pickers.

### Prevalence of LBP among tea pickers and Non-tea pickers

The overall prevalence of LBP was 45.4% for tea pickers and 39.5% for non-tea pickers as shown in table 2.

### **Prevalence of LBP in relation to socio-demographic characteristics of tea and non-tea pickers of JFK Ltd**

Majority of those who reported to have suffered from LBP were aged 42 years and above among tea pickers and non-tea pickers at 50% and 43.9% respectively. Majority of males were tea pickers at 61.2% while 61.7% of males who were non-tea pickers formed the highest proportion. Most tea pickers and non-tea pickers were married at 86.8% and 91.5% respectively. Most of tea pickers and non-tea pickers reported to have had more than two children at 68.5% and 83% respectively. Table 3 provides summary of the prevalence of LBP in relation to socio-demographic characteristics.

### **Risk factors associated with LBP among tea and non-tea pickers of JF (K) Ltd.**

Occupational risk factors associated with LBP are summarized in table 4. Majority, of both tea pickers and non-tea pickers who reported to have suffered LBP had absented themselves from work due to LBP at 60.5% (92/152) and 57.4% (27/47) respectively. However, there was significant association between LBP and absenteeism from work due to LBP between tea pickers and non-tea pickers respectively ( $\chi^2=106.112$ ;  $P=0.000$  and  $\chi^2=53.500$ ;  $p=0.000$ ). There was no significant relation between LBP suffering and LBP as a result of injury between the two study populations. However, majority of both tea pickers and non-tea pickers thought that LBP was not as a result of injury at 97.4% (148/152) and 95.7% (45/47) respectively. The above scenario was also found between the two study populations who reported to have suffered LBP due to family history of low back pain. Smoking was significantly associated with LBP between tea pickers and non-tea pickers ( $\chi^2=10.914$ ;  $P=0.001$  and  $\chi^2=36.510$ ;  $p=0.000$ ) respectively. However, majority of both tea pickers and non-tea pickers reported to have suffered LBP and yet they were not smoking, at 71.1% (108) and 51.1% (24) respectively. There was also significant association between LBP and alcohol drinking between tea pickers and non-tea pickers ( $\chi^2=9.061$ ;  $P=0.003$  and  $\chi^2=36.510$ ;  $p=0.000$ ) respectively. However, both the tea pickers and non-tea pickers who reported to have not been drinking and had suffered LBP formed the highest proportion at 65.8% (100) and 51.1% (24) respectively. How long an individual had worked in each of the occupation was found to be related to LBP between tea pickers and non-tea pickers ( $\chi^2=8.643$ ;  $P=0.034$  and  $\chi^2=6.013$ ;  $p=0.049$ ) respectively. However, majority, 68.4% (104) of tea pickers who reported to have suffered LBP had worked for more than 2 years while majority, 55.3% (26) of non-tea pickers who reported to have suffered LBP had worked for 1-2 years. The number of hours an individual worked per day showed significant association with LBP among tea pickers only ( $\chi^2=17.192$ ;  $p=0.000$ ). However, majority of both tea pickers and non-tea pickers who reported to have suffered LBP had worked 6-8hours per day at 88.2% (134) and 83% (39) respectively. There was a significant association between LBP and whether one thought that occupation status had caused him/her to suffer LBP between both tea pickers and non-tea pickers ( $\chi^2=210.290$ ;  $p=0.000$  and  $\chi^2=100.949$ ;  $p=0.000$ ) respectively. However, majority of both tea pickers and non-tea pickers reported to have suffered LBP and thought that their occupation had caused them to suffer LBP at 93.1% (134) and 95.7% (45) respectively. Furthermore, the number of kilograms of tea leaves picked and the number of kgs carried per day was also significantly associated with LBP ( $\chi^2=16.882$ ;  $p=0.000$  and  $\chi^2=15.978$ ;  $p=0.001$ ) respectively. However, majority reported to have harvested between 20-50kgs and carried approximately 12kgs of green leaves per basket at 55.9% (85) and 68.4% (104) respectively. In regards to how one carried tea leaves to the nearest collection point, majority of whom reported to have suffered from LBP carried packed bags of green leaves to the weighing bays on their backs. However, there was no significant association between LBP and how the baskets were carried. There was a significant association of LBP with carrying of heavy load and how one sharpened farm tools among the non tea pickers who reported to have suffered LBP ( $\chi^2=13.129$ ;  $p=0.000$  and  $\chi^2=4.125$ ;  $p=0.042$ ) respectively.

### **Multivariate analyses**

Linear regression was done on variables that were found to be significant at bivariate level, to determine the factors that independently contribute to LBP among tea pickers and non-tea pickers. A summary of multivariate analyses are shown in table 5.

## **4. Discussion**

Few studies to determine the prevalence and risk factors for LBP among tea and non-tea pickers in developing countries including Kenya have been conducted. Therefore, there is not much literature information regarding the prevalence/epidemiology of LBP among tea and non-tea pickers in developing countries as it has not been well documented.

In this study, point prevalence was investigated between tea pickers and non-tea pickers and was found to be high. The point prevalence was 45.4% and 39.5% among tea pickers and non-tea pickers respectively. However,

these study findings differed with another Kenyan study that reported the prevalence of back pain at 64% among the tea pickers. Moreover, of these, 29 % had a history of back pain before they started picking tea. Furthermore, they found out that 35 % of the workers developed back pain due to occupational exposure to tea picking (Muruka, 1999). In another Brazilian study, Ferreira *et al.*, (2011) reported a 63.1% (95%CI 59.9 to 66.1) period prevalence of back pain at least once in the 12 months prior to the interview among adults. These results are in discrepancy with this study that found a 45.4% (152/454) and 39.5% (47/119) point prevalence among tea pickers and non-tea pickers respectively. The discrepancy is due to different populations in different occupation studied. In a previous study (Tomita *et al.*, 2010) that assessed the prevalence and risk factors of LBP among Thai and Myanmar sea food processing factory workers, investigated both point and period prevalence. The point prevalence, 7-d prevalence, and 12-months prevalence were 28.5% (47/165), 32.1% (53/165) and 44.8% (74/165) respectively among the general population. However, the point prevalence, 7-d prevalence, and 12-months prevalence were 42.4% (36/85), 47.1% (40/85) and 68.2% (58/85) respectively among Thai workers whereas the point prevalence, 7-d prevalence, and 12-months prevalence were 13.8% (11/80), 16.3% (13/80) and 20% (16/80) respectively among Myanmar workers. These results are inconsistent with this study due to different study populations of different nationality. Furthermore, there was difference between the two studies due to the different occupational settings. The present study that investigated the general characteristics of the respondents showed that majority, 38.5% of tea pickers were aged between 26-33 years while slightly half of non-tea pickers 52.1% were aged 34-41 years. These results were not in agreement with the previous study (Tomita *et al.*, 2010) which reported that most of the Thai workers who were interviewed were aged  $\geq 40$  years making 41.2% (n=35) whereas majority of Myanmar workers were aged  $< 30$  years representing 80% (n=64). In addition, this study was not consistent with the previous study conducted by Tomita *et al.*, 2010 indicated that LBP was independently associated with older age of  $\geq 40$  years, perception of health status, history of back injury, twisting posture at work, and slipping on wet floor. The discrepancy between the two studies was as a result of differences in study populations studied, different geographical locations, different variables investigated and different cadres of the two populations. Moreover, this study reported 61.2% and 61.7% LBP prevalence among males (both tea pickers and non-tea pickers respectively) as compared to females at 38.8% and 38.3% respectively in the same population. These results are not in agreement with a study done by Seyed *et al.*, (1997) on LBP among different groups of subjects exposed to hand-arm transmitted vibration which showed that the female strawberry farmers had the highest prevalence of LBP (84.0%, 95% CI=73.8-94.2%), followed by the female green tea farmers (63.0%, 95% CI=44.8-81.2%). The prevalence of LBP in the female strawberry farmers was even higher than the males doing the same job, but the figure among the female green tea farmers was lower than the male farmers engaged in green tea production. This discrepancy is due to different sample sizes distributions and different study populations in different geographical areas among the two study groups.

## 5. Conclusions

The prevalence of LBP was found to be high among both tea pickers and non-tea pickers, 45.4% and 39.5% respectively. The occupational risk factors that were found to be statistically significant among tea pickers are: age; duration of work, number of hours worked per day, amount of green tea leaves carried by an individual and how normally an individual carries heavy load. The socio-demographics factors that were found to be statistically significant were: age and parity among both tea and non-tea pickers.

We recommend that there is need to consider reviewing tea picking policies for instance introduction of tea picking devices in order to alleviate occupational health hazards associated with tea picking.

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**Table 1 Socio-demographic Characteristics of tea pickers and non-tea pickers**

Variable	Tea pickers		Non-tea pickers		Total
	Frequency( N= 335)	100%	Frequency( N=119)	100%	
<b>Age in yrs</b>					
18-25	16	4.8	8	6.7	24
26-33	129	38.5	18	15.1	147
34-41	76	22.7	62	52.1	138
42-49	114	34.0	31	26.1	145
<b>Gender</b>					
Male	219	65.4	65	54.6	284
Female	116	34.6	54	45.4	170
<b>Marital status</b>					
Married	287	85.7	109	91.6	396
Single	36	10.7	1	0.8	37
Widowed	9	2.7	8	6.7	17
Separated	3	0.9	1	0.8	4
<b>Parity</b>					
One	20	6.0	14	11.8	34
Two	105	31.3	28	23.5	133
> two	188	56.1	77	64.7	265
None	22	6.6	0	0	22

**Table 2 Prevalence of low back pain among tea pickers and Non-tea pickers**

Variable	Tea pickers N=335		Non- tea pickers N=119	
	Frequency	Percent	Frequency	Percent
Yes	152	45.4	47	39.5
No	183	54.6	72	60.5
Total	335	100%	119	100%

**Table 3 Prevalence of Low back Pain in relation to socio-demographic characteristics**

Variable	Low Back Pain status of the respondents						
	Tea pickers (n=335)			Non- tea pickers (n=119)			Total
	Yes	No	P-value	Yes	No	P-value	
<b>Age</b>			<b>0.000*</b>			<b>0.000*</b>	
18-25	2 (1.3%)	14(7.7%)		0(0%)	8(11.1%)		24
26-33	28(18.4%)	101(55.2%)		8(17%)	10(13.9%)		147
34-41	46(30.3%)	30(16.4%)		16(34%)	46(63.9%)		138
42-49	76(50%)	38(20.8%)		23(48.9%)	8(11.1%)		145
<b>Gender</b>			0.142			0.210	
Male	93(61.2%)	126(68.9%)		29(61.7%)	36(50%)		284
Female	59(38.8%)	57(31.1%)		18(38.3%)	36(50%)		170
<b>Marital status</b>			0.188			0.288	
Married	132(86.8%)	155(84.7%)		43(91.5%)	66(91.7%)		396
Single	14(9.2%)	22(12%)		1(2.1%)	0(0%)		37
Widow(er)	3(2%)	6(3.3%)		2(4.3%)	6(8.3%)		17
Separated	3(2%)	0(0%)		1(2.1%)	0(0%)		4
<b>Parity</b>			<b>0.014*</b>			<b>0.002*</b>	
One	6(4.1%)	14(8.4%)		4(8.5%)	10(13.9%)		34
Two	40(27.4%)	65(38.9%)		4(8.5%)	24(33.3%)		133
>two	100(68.5%)	88(52.7%)		39(83%)	38(52.8%)		265
None	22(13.1%)	0(0%)		0(0%)	0(0%)		22

\* Significant  $p \leq 0.05$

**Table 4 Occupational risk factors of Low Back pain among tea and non-tea pickers**

Variable	Risk factors of LBP						Total
	Tea pickers (n=335)		P-value	Non- tea pickers (n=119)		P-value	
	Yes	No		Yes	No		
<b>Absent from work due to LBP</b>			0.000*			0.000*	
Yes	92(60.5%)	14(7.7%)		27(57.4%)	0(0%)		133
No	60(39.5%)	167(92.3%)		20(42.6%)	72(100%)		319
<b>LBP due to injury</b>			0.609			0.078	
Yes	4(2.6%)	6(3.6%)		2(4.3%)	0(0%)		12
No	148(97.4%)	159(96.4%)		45(95.7%)	72(100%)		424
<b>Family history of LBP</b>			0.175			0.078	
Yes	12(7.9%)	8(4.4%)		2(4.3%)	0(0%)		12
No	140(92.1%)	175(95.6%)		45(95.7%)	72(100%)		424
<b>Do you smoke</b>			0.001*			0.000*	
Yes	44(28.9%)	26(14.2%)		23(48.9%)	2(2.8%)		95
No	108(71.1%)	157(85.8%)		24(51.1%)	70(97.2%)		359
<b>Alcohol uptake</b>			0.003*			0.000*	
Yes	52(34.2%)	36(19.7%)		23(48.9%)	2(2.8%)		113
No	100(65.8%)	147(80.3%)		24(51.1%)	70(97.2%)		341
<b>Work duration</b>			0.034*			0.049*	
<6 months	2(1.3%)	0(0%)		0(0%)	0(0%)		2
6-12 months	2(1.3%)	12(6.6%)		0(0%)	4(5.6%)		18
1-2 yrs	44(28.9%)	58(31.7%)		26(55.3%)	26(36.1%)		154
>2 yrs	104(68.4%)	113(61.7%)		21(44.7%)	42(58.3%)		280
<b>How many hrs do you work/day</b>			0.000*			0.150	
5 hours	2(1.3%)	4(2.2%)		0(0%)	0(0%)		6
6-8 hrs	134(88.2%)	127(69.4%)		39(83%)	66(91.7%)		366
>8 hrs	16(10.5%)	52(28.4%)		8(17%)	6(8.3%)		82
<b>Has your occupation caused you to suffer LBP</b>			0.000*			0.000	
Yes	134(93.1%)	22(12.2%)		45(95.7%)	2(2.9%)		203
No	10(6.9%)	159(87.8%)		2(4.3%)	68(97.1%)		239
<b>Total kgs green leaves/ day</b>			0.000*			-	
12-20kg	4(2.6%)	6(3.3%)		-	-		10
20-50kg	85(55.9%)	139(76%)		-	-		224
>50kgs	63(41.4%)	38(20.8%)		-	-		101
<b>Approx. how many kgs do you carry</b>			0.001*			-	
<12 kg	2(1.3%)	0(0%)		-	-		2
12kgs	104(68.4%)	149(82.3%)		-	-		253
12-20kg	46(30.3%)	28(15.5%)		-	-		74
>20 kg	0(0%)	4(2.2%)		-	-		4
<b>How do you carry the basket</b>			0.252			-	
Head	2(1.3%)	4(2.2%)		-	-		6
Trolley	2(1.3%)	0(0%)		-	-		2
Back	148(97.4%)	179(97.8%)		-	-		327
<b>Distance to the collection point</b>			0.184			-	
100 m	32(21.1%)	50(27.3%)		-	-		82
>100m	120(78.9%)	133(72.7%)		-	-		253
<b>Do you carry heavy load</b>			-			0.000*	

Yes	-	-	41(87.2%)	40(55.6%)	81
No	-	-	6(12.8%)	32(44.4%)	38
<b>If yes, how do you carry it</b>		-			0.736
Trolley	-	-	2(4.9%)	4(9.1%)	6
Shoulder	-	-	30(73.2%)	30(68.2%)	60
Back	-	-	9(22%)	10(22.7%)	19
<b>Do you sharpen tools</b>		-			0.042*
Yes	-	-	47(100%)	66(91.7%)	113
No	-	-	0(0%)	6(8.3%)	6

\* Significant  $p \leq 0.05$

**Table 5: Factors that contribute to LBP among both tea and non-tea pickers of JFK Ltd**

Variable	Tea pickers		Non-tea pickers	
	P value	95% CI	P value	95% CI
1.Age in years	P=0.022*	9.4-7	-	-
2. Have you been absent from work due to LBP	P=0.010*	2.7-19.5	P=0.000*	11.9-29.1
3.How many hours worked per day	P=0.000*	23.1-38.5	-	-
4.Do you think your occupation has caused you to suffer LBP	P=0.000*	62.2-79.3	P=0.000*	69.8-86.8
5.How many Kgs do you carry	P=0.011*	17.8-2.3	-	-
6.Do you take alcohol	-	-	P=0.008*	3.2-20.7
7.Do you carry heavy load	-	-	P=0.018*	1.8-18.2
8.How long have you been working	-	-	P=0.002*	14.3-3.2

\* Significant  $p \leq 0.05$