

**MUSCLE-SKELETAL SYMPTOMS IN INFORMAL RECYCLERS OF  
CARTAGENA DE INDIAS (COLOMBIA)**

**SÍNTOMAS MUSCULOESQUELETICOS EN RECICLADORES INFORMALES DE  
CARTAGENA DE INDIAS (COLOMBIA)**

Edna M. Gómez-Bustamante<sup>1</sup>

Olga P. Moadie-Contreras<sup>2</sup>

Saray S. Sayas Salas<sup>3</sup>

Zaira Villanueva-Julio<sup>4</sup>

Carlos A. Severiche-Sierra<sup>5</sup>

**Abstract**

In this study, the musculoskeletal symptoms were determined in the informal recyclers of Cartagena de indias, during the year 2017. It is a descriptive cross-sectional study, the population studied was one hundred and fifteen informal recyclers of any age and gender, for the data collection for each of the individuals, with prior and informed consent of the Standardized Nordic Questionnaire. Results 51.5% (n = 59) were men and 48.5% (n = 56) women, the anatomical region with the most symptoms was the lumbar region 66%, neck 61% and upper back 59%, and it was the ailments that had the greatest Interference with work: household chores, was also the illness that lasted longer in the last 12 months and which is still present in several respondents. There was no difference in the symptomatology with respect to the age range or sex. The perception of musculoskeletal symptoms in the informal

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<sup>1</sup> Doctora en Ciencias de la Educación, Magister en Enfermería con énfasis en Salud Familiar, Especialista, Educación con énfasis en Evaluación, Especialista en Salud Familiar, Enfermera. Docente investigadora Universidad de Cartagena. Cartagena de indias, Colombia. Correo electrónico: [egomez@unicartagena.edu.co](mailto:egomez@unicartagena.edu.co)

<sup>2</sup> Especialista en Gestion del Riesgo Laboral. Estudiante de Posgrado en la Facultad de Enfermeria de la Universidad de Cartagena. Cartagena de indias - Colombia. [omoadiec@unicartagena.edu.co](mailto:omoadiec@unicartagena.edu.co)

<sup>3</sup> Especialista en Gestion del Riesgo Laboral. Estudiante de Posgrado en la Facultad de Enfermeria de la Universidad de Cartagena. Cartagena de indias - Colombia. [sayass@unicartagena.edu.co](mailto:sayass@unicartagena.edu.co)

<sup>4</sup> Especialista en Gestion del Riesgo Laboral. Estudiante de Posgrado en la Facultad de Enfermeria de la Universidad de Cartagena. Cartagena de indias - Colombia. [zvillanuevaj@unicartagena.edu.co](mailto:zvillanuevaj@unicartagena.edu.co)

<sup>5</sup> Doctor en Ciencias, Magíster en Desarrollo Sostenible y Medio Ambiente, Especialista en Ingeniería Sanitaria y Ambiental, Especialista en Seguridad y Salud en el Trabajo, Químico. Docente Investigador Universidad de Cartagena. Cartagena de indias – Colombia. [cseveriches@unicartagena.edu.co](mailto:cseveriches@unicartagena.edu.co)

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recyclers of the city of Cartagena was predominantly in the lower back, neck and upper back, and were the ailments that had the greatest interference with work and home.

**Keywords:** Health conditions, Working conditions, Ergonomics, Recycling.

### **Resumen**

En este estudio, los síntomas musculoesqueléticos se determinaron en los recicladores informales de Cartagena de indias, durante el año 2017. Se trata de un estudio descriptivo de corte transversal, la población estudiada fue de ciento quince recicladores informales de cualquier edad y género, para la recopilación de datos para cada uno de los individuos, con consentimiento previo e informado del Cuestionario Nórdico Estandarizado. Resultados 51.5% (n = 59) eran hombres y 48.5% (n = 56) mujeres, la región anatómica con más síntomas fue la región lumbar 66%, cuello 61% y espalda superior 59%, y fueron las dolencias que tuvieron La mayor interferencia con el trabajo: las tareas del hogar, fue también la enfermedad que duró más tiempo en los últimos 12 meses y la que todavía está presente en varios encuestados. No hubo diferencia en la sintomatología con respecto al rango de edad o al sexo. La percepción de los síntomas musculoesqueléticos en los recicladores informales de la ciudad de Cartagena fue predominantemente en la parte baja de la espalda, el cuello y la parte superior de la espalda, y fueron las dolencias que tuvieron la mayor interferencia con el trabajo y el hogar.

**Palabras claves:** Condiciones de salud, Condiciones laborales, Ergonomía, Reciclaje.

### **Introduction**

The advance of globalization has served as a catalyst to increase industrial development worldwide, the incessant search to meet the needs of the population and the overflowing interest of producing more consumer goods every day, they bring with it that once the useful life of these products begins the appearance of associated waste, becoming a topic of environmental problems and difficult to manage, especially in underdeveloped countries (Gómez et al., 2018; Severiche et al., 2017; Severiche et al., 2016). There are some key variables in the generation of solid waste, among them are the number of inhabitants, the

amount of solid waste, its biodegradability and the precarious management plans (Gomez & Severiche, 2018). Consequently, these variables are causal of aesthetic, environmental, public health, land devaluation, and other problems (Bedoya et al., 2017; Acevedo & Severiche, 2013).

The problem of urban solid waste is not exclusive to large metropolises; it is also a general issue for medium and small populations (Bedoya & Torres, 2015; Cardona et al., 2009). One of the strategies currently to try to mitigate the problem is recycling, its relevance is given by reducing waste with a low cost (Severiche et al., 2014), it has become a business object, influenced by green policies, where the perks are displayed in the sustainable economy of the industries, always seeking to lower costs in raw material, and transforming into recovery, transformation and commercialization of reusable waste (Ballesteros et al., 2008).

The commercialization of recyclable materials has grown in Latin America and globally, it commonly stands out as a usual task in large cities, although this trade dates from the late nineteenth century, in recent times has taken more boom forced by the lack of employment (Villanova, 2012). They have taken the name of informal recyclers, generally deploy their work in perishable sanitary conditions, labor uncertainty, a total absence of social benefits and disengagement from health services and, unknown to the integrated municipal solid waste management system (Arrázola et al., 2017; Terraza & Sturzenegger, 2010).

The recycler by the office that develops and given contact with different types of waste are exposed to various risk factors, including an outline of these are, exposure to microorganisms, vapors and toxic leachates from the decomposition of waste, extreme temperatures, ultraviolet radiation, discrimination and rejection by the community, vehicular traffic and excessive physical charges (Neitzel et al., 2013; Bleck & Wettberg, 2012). Solid waste management covers a wide range of activities such as the collection and separation of recyclable material, transportation of the material from the generation site to the site of its disposal (Gomez et al., 2008). The activities related to the recycling of solid waste are carried out manually, a task that requires heavy physical and repetitive loads (Yang et al., 2001). Musculoskeletal disorders are the most common non-fatal problems (Agila et al., 2014; Rosario & Amezquita, 2014).

According to the National Institute for Occupational Safety and Health (NIOSH), a work-related musculoskeletal disorder is an injury to the muscles, tendons, ligaments, nerves,

joints, cartilages, bones or blood vessels of the arms, legs, the head, neck or back that is produced or aggravated by work tasks, such as lifting, pushing or pulling objects.

Known the relevance that the study of the labor biomechanical factors has collected lately and with the purpose of being able to know the characteristics and towards where the investigations are oriented in this area, the main objective of this study was to determine the musculoskeletal symptoms in informal recyclers of Cartagena de indias, during the first period of 2017.

### **Materials and Methods**

1. *Type of study.* A descriptive cross-sectional study was carried out, which is used to measure the prevalence of an exposure and / or result in a defined population and at a specific point of time, simply describe the frequency of an exposure (s) or result (s) in a defined population (Ato et al., 2013).

2. *Population and sample.* A census was taken to collect the information. The participants met the inclusion criteria, such as people of any age and gender dedicated to recycling, over 18 years of age, with integrity in the locomotor system, ability to establish communication and willingness to participate in the study voluntarily, with consent prior and informed. The population was integrated by 115 environmental recoveries distributed in the neighborhoods Henequén, Bicentenario, Ceballos, El Bosque and Chambacú of the District of Cartagena de indias-Bolívar (Colombia), given that these sectors are easily accessible for the collection of information. The data was collected in the first half of 2017.

3. *Instrument and collection of the information.* Standardized Kuorinka Nordic Questionnaire (CNK) (Kuorinka, 1987) It is based on occupational diagnosis under the ergonomic environment musculoskeletal disorders. Its relevance is given by the information that allows to estimate the level of risks proactively and the qualitative evaluation of pain and fatigue. The questions focus on most of the symptoms that are often detected in different work activities.

First National Survey of Health Conditions and Work in the General System of Professional Risks (MPS, 2007). It serves to identify the sociodemographic factors of waste

pickers, as well as risk agents in the workplace. For the collection of the information, the instrument is applied through an interview to the different recyclers considered in the study.

4. *Process.* Data was collected through the application of the exposed instruments. The data were processed statistically using Microsoft Excel 2013. In its analysis descriptive statistics were used, mainly the distribution of absolute and relative frequencies, measures of central tendency and variability.

5. *Declaration on ethical aspects.* In order to preserve the right to confidentiality of information, informed consent was implemented to all participants, to inform about the object and benefits of this to their health and work. In the same sense, the ethical aspects were worked up as established by resolution No. 008430 of 1993, which establishes the scientific, technical and administrative norms for health research (MinSalud, 1993).

## Results

*Sociodemographic characteristics.* Table 1 shows the sociodemographic characterization of the surveyed population. The majority of workers are between 26 and 49 years old (60.86%); While only 12.17% are under 26 years old. For sex, the proportion between men and women are very similar. Relationship with the level of education, the highest proportion of workers. The most dominant civil status is the free and single union, and there is little consumption of liquor and cigarettes.

Table 1.  
*Sociodemographic characteristics.*

Variables	Category	Total (n)	Percentage (%)
Age	<25 years	14	12.17
	26-39 years	35	30.43
	40 - 49 years	35	30.43
	> 50 years	31	26.96
Sex	Male	59	51.30
	Female	56	48.70
Education	Any	17	14.78
	Primary	19	16.52
	High school	59	51.30
	Technique	17	14.78

	Professional	3	2.61
	Single	42	36.52
	Married	25	21.74
Civil status	Free Union	42	36.52
	Widower	3	2.61
	Separated	3	2.61
Consume cigarette	Yes	14	12.17
	Do not	101	87.83
Drink Liquor	Yes	49	42.61
	Do not	66	57.39

*Labor conditions.* In terms of service time as a recycler, it is found that the vast majority is in the range of more than eight years of service; in relation to working days per week, from two to four days (30%), from 5 to 6 days (64%) and every day 6%; the daily hours worked, from one to five hours (50%), from six to 10 hours (48%); In terms of working hours, most of the activities were carried out during the day with 64%. Among the individual factors of use of the personal protection elements, the majority reported not using personal protection elements. Of the participants, 100% report having had some type of accident during work in the last 12 months. The type of injury produced when handling the recycled material was: Wounds 27%, blows 45%, burns 12% insect bites 9% and other 6%, Table 2 shows in detail the labor characteristics of the informal recyclers surveyed.

Table 2  
*Labor characteristics.*

Variables	Category	Total (n)	Percentage (%)
Service time	Less 1 year	10	9
	13 years	18	15
	47 years	49	42
	More than 8 years	38	33
Days of work per week	2 - 4 days	35	30
	5 - 6 days	73	64
	7 days	7	6
Hours of work per day	1-5 hours	57	50
	6-10 hours	56	48
	More than 11 hours	2	2
Workday	Day	73	64

	Nocturnal	18	15
	Both	24	21
Use of EPP	Yes	38	33
	Do not	77	67
Have an accident in the last year	Yes	100	100
	Do not	0	0
Occurrence of injuries	Wounds	31	27
	Hits	52	45
	Burns	14	12
	Insect bites	10	9
	Others	8	6

*Skeletal muscle symptoms.* Table 3 shows the results of the presence of musculoskeletal symptoms, pain and discomfort, evaluated through the CNK, it was found that, in the last 12 months, the neck region has discomfort 64%, shoulders 48%, high back 39%, elbow 12% hand wrist 45%, sword low 48%, knee 21%, foot ankle 30%.

Table 3  
*Perception of musculoskeletal symptoms according to anatomical region and gender - 12 months.*

Gender	Variables	Category	Percentage(%)
Female	Neck	Law	63
		Left	69
	Shoulders	Law	44
		Left	38
	High Back	Law	0
		Left	0
	Elbow	Law	50
		Left	13
	Hand Wrist	Law	0
		Left	44
	Lower back	Law	38
		Left	44
	Hip Thigh	Law	13
		Left	6
	Knee	Law	19
		Left	13
Ankle foot	Law	19	
	Left	31	

Male	Neck	Law	65
		Left	53
	Shoulders	Law	53
		Left	35
	High Back	Law	29
		Left	12
	Elbow	Law	18
		Left	47
	Hand Wrist	Law	24
		Left	53
	Lower back	Law	6
		Left	6
	Hip Thigh	Law	24
		Left	24
	Knee	Law	29
		Left	29
	Ankle foot	Law	29
		Left	29

In the same sense, the presence of musculoskeletal symptoms for the different ethereal groups is also observed in Table 4. In children under 21 years, 66.7% in neck, lower back 93.3%, knee 54%, foot ankle 33.3% and hand wrist 33.3%; for the range of 21 - 30 years, neck, shoulders, high back, wrist hand, hip thigh, knee, foot ankle, all marked the same percentage of 57.1% respectively in this ethereal group; from 31 - 40 years old, neck 54.84%, shoulders 54.84%, upper back 32%, elbow 22.5%, hand wrist 54.84%, knee 45.1%, foot ankle 77.4%; of 41 - 50 years, neck 91.4%, shoulders 60%, high back 68.5%, elbow 31.43%, wrist hand 60%, lower back 60%, hip thigh 31.4%, knee 40% and foot ankle 31.4%; in people older than 50 years, the region with the most involvement is neck with 87.5%, followed by shoulders, with 78.13%, high back 78.13%, low back, thigh hip and hand wrist 56.2% respectively, knee 21.8%, foot ankle 34.3%.

Table 4  
*Perception of musculoskeletal symptoms according to anatomical region and age- 12 months.*

Age < 21		Age 21 - 30		Age 31 - 40		Age 41 - 50		Age > 51	
(n)	Percentage(%)	(n)	Percentage(%)	(n)	Percentage(%)	(n)	Percentage(%)	(n)	Percentage(%)
7	66,67	4	57,14	17	54,84	32	91,43	28	87,5
0	0	4	57,14	17	54,84	21	60	25	78,13



0	0	4	57,14	10	32,26	24	68,57	25	78,13
0	0	4	57,14	7	22,58	11	31,43	25	78,13
3	33,33	4	57,14	17	54,84	21	60	18	56,25
9	93,33	0	0	17	54,84	21	60	18	56,25
0	0	4	57,14	0	0	11	31,43	18	56,25
5	54	4	57,14	14	45,16	14	40	7	21,88
3	33,33	0	0	24	77,42	11	31,43	11	34,38

Similarly, Table 5 evidences that, the intensity of the pain in the corporal regions was determined by means of visual scale, having 10 as the greatest intensity of pain and one as without pain. For which reported neck with a pain classified from seven to 10 in 27% of the population followed by high back and low back with moderate intensity in 19%. The other body regions were found in ranges of mild intensity.

Table 5

*Percentage of prevalence of musculoskeletal symptoms.*

Pain intensity	Neck	Shoulder	High Back	Elbow	Wrist-hand	Lower back	Hip	Knee	Ankle foot
Absence of pain 1	30,3	21,21	30,3	27,27	24,24	27,27	39,39	27,27	36,36
Mild intensity (3 -2)	36,36	42,42	48,48	45,45	33,33	33,33	24,24	36,36	39,39
Moderate Intensity (6 - 4)	36,36	36,36	30,3	48,48	45,45	42,42	39,39	33,33	24,24
Severe Intensity (10 -7)	24,24	24,24	24,24	18,18	39,39	30,3	66,67	27,27	45,45

*Risk factors according to musculoskeletal symptoms.* Regarding the risk factors for musculoskeletal symptoms, it was identified according to the claim of the recyclers, that 53.3% performed load mobilization in more than half of the working day; 62.9% of recyclers perform repetitive movement in hands and arms throughout the day. 41.2% of the workers with symptoms reported being exposed to the same position and causing fatigue throughout the day. 82.4% must mobilize loads without mechanical aids, and with the highest percentage of exposure throughout the day.

### Discussion

Similar results to the present study were reported by several authors, Ivens et al. (1998) in the Netherlands, who identified a higher prevalence of symptoms in lower back, hands, and ankles and feet, in the same way Pradeep and Dhananjay (2016) evidenced symptomatology

in the lower back and shoulders. Inyang (2007) in Nigeria, showed similarity of results with the present research on shoulders and lower back. Additionally, the results of Reddy and Yasobant (2015), found that the most frequent discomfort occurs in the shoulders, knee and lower back, finally, the research of Morales et al. (2016) in Lima, where discomfort in the lower back prevailed in the recycling workers.

Contrary data found by Yang et al. (2001) in Taiwan reporting the symptomatology at the hip and elbow levels; In turn, in Brazil, Robazzi et al. (1997) found that the predominant symptom was in knees and finally in Argentina. Parizeau (2015), that I found syndromes in the hips and knees.

In the studied population, more than 67% of recyclers reported not using personal protection items consisting of: masks, gloves, anti-fluid clothing and boots. Other authors reflect similar results, such as Inyang (2007), where 76% of the recyclers surveyed do not use personal protection elements during their work, Morales et al. (2016) reports that 57.9% of recyclers do not use the elements of protection personal.

Blows and wounds were reported more frequently in their daily recycling activities, followed by burns, all caused by rummaging and handling waste. Robazzi et al. (1997), found that the main occupational accidents in waste pickers are bruises and cuts, and cases such as Inyang (2007), with 79% of recyclers have suffered contusions and 57% of cuts.

The analysis of prevalent musculoskeletal symptoms by ethereal group shows that during the last 12 months, children under 21 years of age report having pain in the lower back. From 21 to 30 neck, shoulders, high and low back, from 31 - 40, shoulders neck and high and low back, from 41 to 50 in neck, shoulders and lower back and in majors of 51 in neck, shoulders, high back and elbows. Similar results were found in the work of Morales et al. (2016), refers to the presence of pain and discomfort by age group was present in the neck region for ages 20 to 39 years and discomfort in knees and lower back in over 50 years.

The present results constitute an important contribution for the populations of informal recyclers that allow to design plans and projects of intervention in the workers of the recycling because this is a growing industry that requires training and attention in their places of work, for the prevention of inherent risks of their work activity through the creation of management systems. Which support the promotion and prevention of work accidents and mitigation of risk factors. The study makes its contribution as a baseline for future research involving the

prevention and control of musculoskeletal symptoms in recycling workers in Cartagena de Indias.

### **Conclusions**

The prevalence of musculoskeletal symptomatology of informal waste pickers in the city of Cartagena de Indias is high, with symptoms more frequent in the neck, lower back and shoulders. Similar results were found in studies worldwide, the recyclers are among the workers exposed to the highest risk of exposure to musculoskeletal disorders, the high percentage of disorders is attributed to the long durations of work days, the non-use of elements of personal protection, and the very nature of their work, which is physically demanding and the lack of education. The recyclers lifestyle is another factor that enhances the symptoms and effects of musculoskeletal symptoms. There is no control or monitoring of the procedural practices of waste pickers, active breaks, hygiene, use of personal protection elements, as well as the performance of activities in which the physical load requirements such as: posture, movement and strength are not cease, when doing housework, or activities that involve the frequent use of the hands lead to injuries in the regions that have more prevalence.

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