



## Pain Perception Assessment During Venipuncture in A Clinical Laboratory of An Academic Hospital

Short title: **Pain perception during venipuncture**

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### Abstract:

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage. <sup>1</sup> Since the beginning of humanity, pain has been one of its main concerns. For this reason, ever since human beings were aware, they have focused on trying to understand and alleviate it. All races and cultures bear ancient testimony of its presence; which has been captured in art and written documents

**Keywords:** Pain perception, venipuncture, clinical laboratory, visual analogic scale, analysis of variance

### Introduction

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage. <sup>1</sup> Since the beginning of humanity, pain has been one of its main concerns. For this reason, ever since human beings were aware, they have focused on trying to understand and alleviate it. All races and cultures bear ancient testimony of its presence; which has been captured in art and written documents.

For primitive civilizations, pain was caused by magical influences and demons; for the ancient Egyptians, Greeks, and Hindus, the heart was the center of painful sensation; and in Chinese medicine, pain is caused by an imbalance in vital energy, so it is not surprising that, in ancient civilizations, priests had a prominent role in caring for patients with pain. It is unclear when the brain replaced the heart as the site of pain. Alcmeon of Crotona, a disciple of Pythagoras (535-? BC) was the first to propose this concept; however, his idea did not take off. Based on Chinese medical concepts, Hippocrates (469-377 BC) proposed the brain as a gland and that pain came from excess or deficiency of vital humor such as blood, phlegm, and yellow and black bile. <sup>2</sup>

It was not until the death of Aristotle that Straton (372-287 BC) proposed that the brain was the center of all sensations, including pain. Herophilus (335-280 BC) promoted this idea and Erasistratus of Alexandria (310-250 BC); promoted that the brain was part of the nervous

system and that the nerves connected to the neuroaxis were of two types, those related to movement and those to sensations. Celsus (25 BC - 50 AD) who included pain in the phenomenon of inflammation took up these ideas; however, he omitted to mention the role of the brain in the sensation of pain. Galen of Alexandria (131-200 AD) revived this idea and developed a theory on the functioning of the nervous system. Nevertheless, Aristotle's hypothesis about the nature of the soul and sensations, and the participation of the heart as their receiving center, continued to be the dominant thesis.<sup>3</sup>

Pain is a global public health problem, more than 1.5 billion people worldwide suffer from pain and approximately 5% of the world's population suffers from neuropathic pain, with incidence rates increasing with age. In the United States, pain is estimated to affect more people than diabetes, heart disease, and cancer combined. While awareness of the problem is increasing, treatments are not always successful but expensive and have serious side effects, including addiction.<sup>4</sup>

The ability to detect noxious stimuli is essential for the survival and well-being of an organism. This neuronal process of encoding noxious stimuli often generates autonomic consequences such as increased heart rate or blood pressure; behavioral consequences such as the withdrawal reflex; or more complex nociceptive behaviors such as licking or rubbing. It is important to note that nociception can occur without the sensation of pain.<sup>6</sup>

This study aimed to estimate pain perception in users of the clinical laboratory of a medium and high-complexity hospital.

#### Methodology:

Prevalence study of pain perception measurement, based on blood samples taken by brachial venipuncture among 7.053 users of the Clinical Library of the Tomas Uribe Uribe Hospital, between January and June 2024.

#### Statistical procedures:

The data were obtained from the daily administrative records of the institutional Clinical Laboratory; patients with complete data were included in the database, once cleaned. The response variable was defined as the measurement of pain perception carried out in the clinical laboratory using the Visual Analogue Scale (VAS). Sex and age, four age groups were created as independent variables.

The evaluation of the comparisons when there were more than two groups was done using the one-way Analysis of Variances (ANOVA) procedure. The difference between some of the groups was verified taking into account the procedures that control the error due to multiple comparisons, based on the homogeneity or not of the variances; likewise, it was evaluated if there was any trend, keeping the tendency of the smallest polynomial based on the principle of Parsimony. The level of statistical significance used for the null hypothesis test was equal to 0.10 to increase the statistical power of the test.<sup>7,8</sup>

#### Laboratory procedures:

During a venipuncture procedure, a healthcare professional disinfects and takes a blood sample from a vein in the arm using a small needle, and draws a small amount of blood into a test tube. After the puncture, each subject recorded in his/her worksheet (VAS scale) intensity of the perceived pain (numeric value) and informed the study team member about this action.

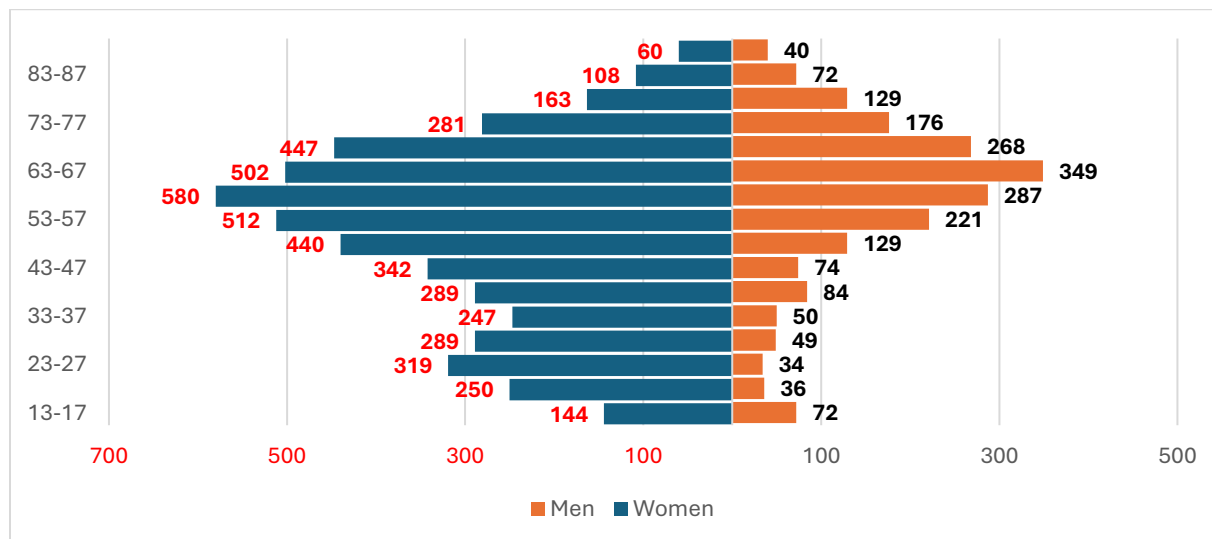
#### Characteristics of the instrument for measuring pain perception:

Patient-reported outcome measures are often considered the "gold standard" for measuring acute and chronic pain. Several questionnaires have been used for pain rates; the Visual Analogue Scale (VAS) consists of a 10 cm horizontal line. Each end represents the minimum and maximum intensity of pain, respectively. The patient is asked to mark on the line the point that relates to the perception of the intensity of pain he or she feels. The institutional laboratory uses it routinely because of its easy application.<sup>7</sup>

These scales, along with other questionnaires and scales, are useful, but not very accurate for measuring pain levels, since it is an experience linked to an emotion and, therefore, subjective. Studies comparing the different methods reported that the most frequently used for measuring pain are valid, but not completely valid.

## Results.

Figure 1: Study population, by age and sex.



Source: Own elaboration.

During the study period, 4,973 (70.6%) were women. The average age and standard deviation were 59.33 and 16.8 in men and 51.6 and 18.4 in women. The difference was statistically significant Student's  $t = -17.01$ , degrees of freedom = 4189.4,  $p = 0.000$ .

Table 1: Pain perception, according to age groups.

			Pain perception					Total
			No pain	Little pain	Moderate	Strong	Very strong	
Age_Group	Youths	Count	549	1016	115	47	64	1791
		%	30.7%	56.7%	6.4%	2.6%	3.6%	100.0%
	Young adults	Count	621	941	109	44	75	1790
		%	34.7%	52.6%	6.1%	2.5%	4.2%	100.0%
	Adults	Count	527	957	122	52	60	1718
		%	30.7%	55.7%	7.1%	3.0%	3.5%	100.0%
	Elderly	Count	737	1197	134	57	81	2206
		%	33.4%	54.3%	6.1%	2.6%	3.7%	100.0%
Total		Count	2434	4111	480	200	280	7505
		%	32.4%	54.8%	6.4%	2.7%	3.7%	100.0%

The pain level in the VAS majority of cases was assessed as no pain 32.4%, and little pain 54.8%.

Table 2: Patients who use the clinical laboratory.

		SEX		Total
		Men	Women	
Age group	Youths (13-41)	308	1483	1791
		14.9%	29.8%	25.4%
	Young Adult (42-57)	441	1349	1790
		21.3%	27.1%	25.4%
	Adult (58-67)	636	1082	1718
		30.7%	21.8%	24.4%
	Elderly (68 y mas)	685	1059	1744

		33.1%	21.3%	24.8%
Total		2070	4973	7043
		100.0%	100.0%	100.0%

Source: Own elaboration.

Although each group contributes the same percentage weight, the contribution of women in the two youngest age groups is greater, in comparison; in the two older groups, the proportional contribution is greater in men. The two youngest groups, among men, represent 37.1% (749/2,020), and the 2 oldest groups 62.9%. Women represent 50.8% (3,581/7,043) and 49.2%, respectively.

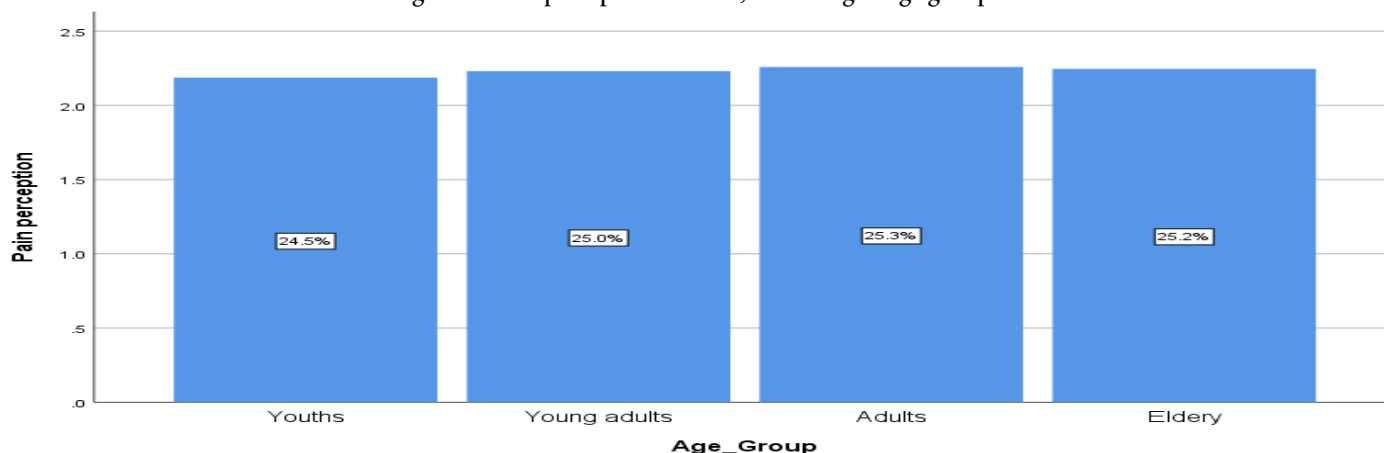
Table 3: Pain perception, according to sex.

		SEX		Total
		Men	Women	
Pain scale	No pain	741	1693	2434
		30.4%	69.6%	100.0%
	Little pain	1237	2874	4111
		30.1%	69.9%	100.0%
	Moderate	163	317	480
		34.0%	66.0%	100.0%
	Strong	73	127	200
		36.5%	63.5%	100.0%
	Very strong	82	198	280
		29.3%	70.7%	100.0%
Total		2296	5209	7505
		30.6%	69.4%	100.0%

Source: Own elaboration.

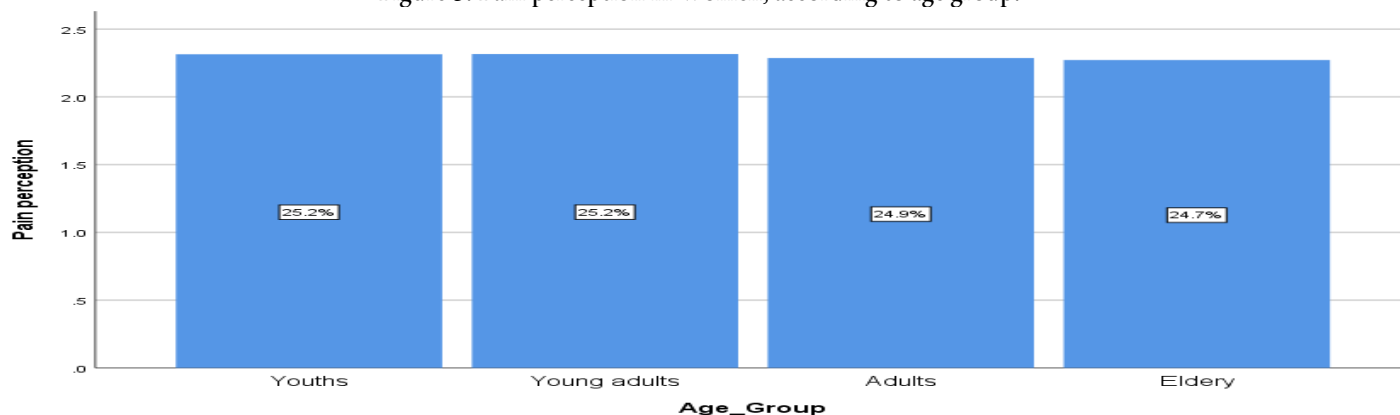
Of the 5,071 patients who perceived pain between little pain and very strong, 3,516 (69.3%) were women and 1,555 (30.7%) were men.

Figure 2: Pain perception in Men, according to age group.



Source: Own elaboration.

The global Snedcor F = 3.2 degrees of freedom 1, 4869 and p = 0.022, meaning there is a significant statistical difference among some age groups. There is a difference in the perception of pain between young people (24.5%) and adults (25.0%) p = 0.02, and elderly (25.2%) p = 0.049, respectively. In men, the perception of pain increased with age, there is a significant positive trend, Snedcor F = 7.4 degrees of freedom = 1, 4869 p = 0.007.

**Figure 3: Pain perception in Women, according to age group.**


Source: Own elaboration.

Among women, the global Snedecor  $F = 1.16$  degrees of freedom 1, 4985 and  $p = 0.32$ , there is no significant statistical difference among age groups. There was no trend either.

#### Discussion:

The users of the clinical laboratory services were mostly women, representing 70.6% (4973/7043). Men had a higher average age, 59.3 versus 51.6, this difference was statistically significant Student  $t = -17.01$ , degrees of freedom = 4189.4,  $p = 0.000$ .

In men, the global Snedecor  $F = 3.2$  degrees of freedom 1, 4869 and  $p = 0.022$ , there is a significant statistical difference among some age groups. There is a difference in the perception of pain between young people (24.5%) and adults (25.0%)  $p = 0.02$ , and elderly (25.2%)  $p = 0.049$ , respectively. The perception of pain increases with age, there is a significant positive trend, Snedecor  $F = 7.4$  degrees of freedom = 1, 4869  $p = 0.007$ .

Among women, there is no significant statistical difference among age groups, Snedecor  $F = 1.16$  degrees of freedom 1, 4985 and  $p = 0.32$ , there was no trend either.

A meta-analysis of 22 clinical laboratory pain studies involving 2.031 clinical laboratory users in China aimed to assess the association between pain occurrence and laboratory maneuvers for blood sampling. Laboratory maneuvers were associated with increased pain perception and more passive coping.<sup>8</sup> Although this study did not use the same methodology, it is important to note that anxiety over the prospect of venipuncture might elevate patients' level of pain perception.<sup>9</sup>

A study conducted in Mexico, with 178 children and adolescents, who underwent venipuncture at the laboratory, used two scales: one to measure pain perception and another for stress. Before the puncture, the children determined how much they thought the procedure would hurt them, a predictive pain measure and two standardized observers rated the degree of apparent stress, an anticipatory stress measure. The response observed in the patient was considered real stress. Finally, the child indicated the degree of pain suffered, and perceived pain. The results showed that the greater the degree of anticipatory stress, the greater the real stress; children who predicted that the pain would be intense obtained higher scores of real stress; older children obtained lower scores of real stress. The higher the education level, the lower the actual stress, and the higher the actual stress when there was a history of recent venipuncture. Male patients showed greater actual stress than female patients did. The presence of parents during the procedure tended to increase actual stress. Although the age groups are not exactly comparable, the comparable result in this study has to do with the variable sex. They reported that the older the patient, the lower the reported stress. In our study, male patients tend to show a tendency to increase their perception of pain as age increases.<sup>10</sup>

In a prevalence study conducted in Iran, most young and middle-aged adults reported a mild discomfort sensation immediately after venipuncture, 43.33% and 36.67%, respectively. A statistically significant difference was found between young adulthood and middle-aged adults concerning facial expressions of pain,  $p = 0.045$ .<sup>11</sup> In our study, there is a difference in the perception of pain between young people

24.5%, and adults 25.0%  $p = 0.02$ , and elderly 25.2%  $p = 0.049$ .

A study conducted in Poland, aimed to determine and measure the blood volume and pain level of 300 volunteers after being punctured, the perceived pain was recorded using the VAS scale. The pain level was assessed as minimal or low.<sup>12</sup> Our study yielded similar results, 32.4% of the patients reported no pain and 54.4% little pain.

In conclusion, an important finding in this study relates to the tendency for pain perception to increase among men as age increases, while there was no trend among women.

Another finding worth highlighting, in men, is that a statistically significant difference was found when comparing the perception of pain between the group of young people and the groups of adults and older adults, with the percentage of pain perception being higher among young people. No difference was found in pain perception between age groups in women.

These findings may be useful for healthcare professionals in clinical laboratories to implement innovative strategies to mitigate the unpleasant and sometimes bothersome perception during the venipuncture procedure.

Conflict of Interests: The authors do not declare any conflict of interest.

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