

Research Paper

Cognitive Distortions and Pain Perception: A Quantitative Study among Female Migraine Sufferers

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ABSTRACT

Migraine is not only influenced by neurological factors but also by psychological factors that fuel Pain Perception which might lead to Cognitive Distortions. The Aim of this study is to understand the Cognitive Distortions and Pain Perception and its relation to Migraine Intensity in working and non-working women. Given the higher prevalence of migraine in women, the study explored whether employment status, family history, marital status influences Cognitive Distortions and Pain Perception. The Objectives were: (i) To measure and compare Pain Perception in participants experiencing Cognitive Distortions. (ii) To examine the influence of family history in women experiencing migraine. (iii) To examine the influence of work status in women experiencing migraine. (iv) To examine the influence of marital status in women experiencing migraine. A total of 100 participants were taken (50 working and 50 non-working women) using convenience sampling and snowball sampling within Kerala as the study was conducted online. “Cognitive Distortions Scale” developed by Briere (2000) and “Pain Perception” by Uday K. Sinha (2000) both consisting of 40 items each were used. The data were analyzed using Karl Pearson correlation, linear regression and t-test. The findings highlight significant impact of these Distortions on Pain Perception and Migraine Intensity, emphasizing their role in experience of migraine in women. Given these insights, future research should continue exploring this relationship to better understand underlying mechanisms and develop targeted interventions. The results indicate that Cognitive Distortions significantly influence Pain Perception and Migraine Intensity. Cognitive Distortion does significantly predict Pain Perception individuals in case of both the predictors i.e., preoccupation with danger, hopelessness and marriage. There is a significant difference between individuals with and without family history in terms of pain persistence and negative emotionality. Married and unmarried women differ significantly.

Keywords: *Cognitive Distortions, Migraine, Migraine Intensity, Pain Perception*

Migraine is a complex neurological disorder characterized by recurrent, often severe headaches accompanied by sensory disturbances such as nausea, photophobia, phonophobia, and, in some cases, visual aura. Migraine may occur with aura (classic migraine) or without aura (common migraine), and other variants include chronic migraine, menstrual migraine, hemiplegic migraine, retinal migraine, abdominal migraine in

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children, silent migraine, and status migrainosus. Symptoms and severity vary across individuals and migraine phases, including prodrome, aura, headache, and postdrome.

According to the WHO, migraine ranks among the leading causes of disability worldwide and is the 12th leading cause of years lived with disability among female. According to the Global Burden of Disease Survey 2000, migraine ranks as the 19th leading cause of disability worldwide, accounting for 1.4% of years lived with disability, highlighting its significant public health impact. Women experience migraines more frequently and often more severely than men, likely due to hormonal, genetic, psychological, and social factors. Globally, migraine affects nearly one billion people, with prevalence peaking after puberty and declining after middle age. Kulkarni, Rao et al. (2016) studied headache prevalence in Karnataka, South India, finding a 1-year prevalence of 63.9%. Migraine was more common in females (OR:2.1) and rural areas (OR:1.5). Tension-type headache (35.1%) was more prevalent in younger individuals, while chronic headache (3.0%) and probable medication-overuse headache (1.2%) were significantly higher in females and rural populations.

Epidemiological studies conducted in India by Kulkarni, Rao et al. (2016) reported a one-year headache prevalence of 63.9% in Karnataka, with migraine being significantly more common among women and rural populations. More recently, Chowdhury, Krishnan et al. (2024) showed a one-year migraine prevalence of 26.3% in Delhi and NCR, again noting female predominance, across headache types, except tension-type headache, suggesting consistency in migraine prevalence patterns across regions in India. Although migraine is primarily a neurobiological disorder involving altered brainstem activity, trigeminal nerve pathways, and neurotransmitters such as neurotransmitters such as serotonin and CGRP, psychological factors play a crucial role in shaping the experience and persistence of pain. Stress, fatigue, hunger, hormonal changes, and environmental triggers are commonly reported, with psychological stress identifies by 50-80% of migraine sufferers as a key precipitating factor.

The relationship between psychological factors and headache has been recognized for centuries. Early medical writings linked emotional distress and suppressed anger to migraine onset. With the developmental of the biopsychosocial model, migraine is now understood as the result of interacting biological, psychological, and social influences rather than purely physiological causes.

Cognitive distortions are irrational, biased patterns of thinking that negatively influence emotional and behavioral response. Common distortions such as self-criticism, self-blame, helplessness, hopelessness, and preoccupation with danger can amplify pain perception, emotional distress, and disability in migraine sufferers. These distorted thought patterns may reduce treatment adherence, increase anxiety, and worsen overall quality of life. Kumari and Singh (2019) found that migraineurs exhibited significantly higher levels of cognitive distortions compared to non-migraineurs, gender had no effect, individuals aged 31-35 had lower cognitive distortions than those aged 36-40. Extending this work, Kumari and Singh (2024) reported that individuals with severe migraine showed higher levels of cognitive distortions than those with mild migraine, suggesting a relationship between migraine severity and maladaptive thinking patterns. A cyclical relationship often emerges in which heightened pain intensifies negative thinking, which in turn amplifies pain perception.

In addition to pain perception and cognitive distortions, studies focused on changes in pain perception across migraine phases and associated cognitive deficits that contribute to

migraine-related disability. Russo, Coppola et al. (2018) reviewed studies on pain perception in migraines through clinical, electrophysiological, and neuroimaging data. They found that pain thresholds were lower during the ictal phase. The study suggests that migraine attacks heighten pain intensity perception, which normalizes between episodes. Santangelo, Russo et al. (2016) examined cognitive function in drug-naïve migraine without aura (MwoA) patients, showing lower cognitive scores in attention, memory, visuospatial, and executive functions compared to healthy individuals. Cognitive deficits correlated with migraine-related disability, but no significant links were found with depression, anxiety, or apathy. The study underscores the need to monitor long-term cognitive decline in MwoA patients.

Emotion regulation and repetitive negative thinking further interact with cognitive distortions to exacerbate migraine experiences. Haratian, Amjadi et al. (2020) demonstrated that individuals with migraine and tension-type headache exhibited significantly poorer emotion regulation and higher repetitive negative thinking. This underscores the importance of emotion focused therapy in headache management.

Psychiatric comorbidities such as depression and anxiety are frequently observed in individuals with chronic headaches and migraines. Psychological distress may also increase the risk of medication overuse, contributing to chronic headache conditions. As a result, psychological interventions are increasingly recognized as essential adjuncts to pharmacological treatment.

Migraine shows a strong genetic component, with individuals having a family history of migraine being at significantly higher risk. Genetic vulnerability increases sensitivity to environmental and psychological triggers, influencing both pain perception and emotional responses. Employment status and marital status may also affect migraine experience, as working and non-working women face different stressors, routines, emotional demands, and social roles, which can influence coping styles and pain interpretation.

Effective migraine management involves a combination of medical treatment, lifestyle modification, and psychological approaches. Lifestyle strategies include maintaining regular sleep and meal schedules, managing stress, engaging in moderate physical activity, avoiding excessive medication use, and identifying personal triggers through migraine diaries. Farmer, Cady et al. (2001) examined cognitive function during acute migraine in 28 patients before and after treatment with sumatriptan nasal spray (20 mg). Results showed significant cognitive impairment in reaction time, attention, memory, and visual-spatial processing during a migraine. After treatment, 86% experienced headache relief and 68% were pain-free at 135 minutes. Cognitive function improvement was strongly correlated with reductions in pain and disability.

Psychological interventions play a vital role in long-term management. Cognitive Behavioral Therapy helps individuals identify and modify maladaptive thought patterns, improve coping skills, and reduce headache frequency. Biofeedback therapy enhances awareness and control of physiological responses such as muscle tension. Mindfulness and relaxation techniques reduce stress, improve pain tolerance, and enhance emotional regulation. Behavioral sleep interventions further support migraine prevention. Abdelmotaleb (2022), in a study among Kuwait participants, found a positive association between cognitive distortions and headache-related disability, particularly among high-income individuals, females, aged 25-40, and those with chronic diseases or higher

education. These findings highlight the relevance of cognitive processes across cultural contexts and suggest the potential benefit of cognitive-based interventions.

This study is significant as it examines the relationship between cognitive distortions and pain perception in women with migraine, an area with limited empirical research. By exploring the influence of family history, work status, and marital status, the study contributes to a more nuanced understanding of psychological treatment approaches such as CBT, improve medication adherence, increase self-efficacy, and promote active self-management. The findings emphasize the need for gender-sensitive and context-specific interventions tailored to women's unique psychological and social experiences.

MATERIALS AND METHODS

The Aim of this study is to understand the Cognitive Distortions and Pain Perception and its relation to Migraine Intensity.

The hypotheses proposed are:

1. There is no significant relationship between cognitive distortion and pain perception in individuals experiencing migraine.
2. Cognitive distortion does not significantly predict pain perception in individuals with migraines.
3. There is no significant difference in cognitive distortions and pain perception between individuals with a family history of migraines and those without.
4. Married and unmarried women with migraine do not differ significantly in cognitive distortions or pain perception.
5. Working and non-working women with migraines do not differ significantly in cognitive distortions or pain perception.

A sample of 100 (50 working and 50 non-working women) between age group of 20-50 years were collected using convenience sampling and snowball sampling within Kerala, through survey methodology utilizing google forms dating. Prior to participation, informed consent and voluntary involvement were assured, with emphasis placed on confidentiality of responses provided.

The tools used were:

The Cognitive Distortions Scale by John Briere (2000) a 40-item self-report questionnaire to assess how often individuals experience cognitive distortions or irrational negative thoughts. Respondents indicate on a 5-point scale how often in the last month they have had specific negative thoughts. CDS has demonstrated construct, convergent, and discriminant validity in general population and in clinical samples. It also demonstrated high reliability, with Cronbach's alpha ranging from 0.89 to 0.97(mean 0.93) in the normative sample and 0.94 to 0.98 (mean 0.96) in the clinical sample.

The "Pain Questionnaire" by Uday K. Sinha (2000) is an Instrument which has various dimensions of pain experience. It has 40 items covering 8 important dimensions of pain experience, the respondent carefully selects either yes or no as answer. The pain questionnaire demonstrated strong reliability, with a test-retest reliability and inter-rate reliability. In terms of validity, it showed a content validity and a cross-validity indicating its effectiveness in measuring pain perception. Appropriate statistical analysis was carried out.

RESULTS AND DISCUSSION

There are three sections out of which, Section A discusses the Karl Pearson correlation analysis, Section B discusses the linear regression analysis and section C discusses the comparison of means based on family history, work status and marital status.

SECTION A

Table 1: Correlation between different dimensions of pain perception and cognitive distortions among migraine suffer

Variables	Persistence	Severity	Duration	Frequency	Interference	Resistance
Control	.247*	.281**	-.157	.130	.160	.326**
Negative emotionality	.357**	.399**	.286**	.208*	.489**	.003
Self-criticism	.154	.335**	.054	.167	.305**	.193
Self-blame	.117	.324**	.073	.165	.229*	.165
Helplessness	.067	.339**	-.026	.118	.231*	.201*
Hopelessness	.117	.326**	.077	.142*	.291**	.056
Preoccupation with danger	.073**	.366	.019	.181	.171**	.317
$P \leq 0.01$ **		$P \leq 0.05$ *				

The table 1 indicates the Correlation between different dimensions of pain perception and cognitive distortions among migraine sufferers. In the table at the 0.01 level of significance, the following variables are statistically significant and positive correlation was found between persistence and negative emotionality, preoccupation with danger; severity and control, negative emotionality, self-criticism, self-blame, helplessness and hopelessness; duration with negative emotionality; interference with negative emotionality, self-criticism, hopelessness and preoccupation with danger; resistance with control.

At the 0.05 level of significance, the following variables are statistically significant and positive correlation was found between persistence and control; frequency and negative emotionality, hopelessness; interference and self-blame, helplessness; and resistance and helplessness. However, other variables do not show any significant differences ($p > 0.05$).

Overall, a significant correlation is observed between the dimensions of cognitive distortions and pain perception. A study by Abdelkader Haggag (2022) aimed to know the level of headache disability and its relationship to cognitive distortions. The study found that headache disability was more common in high-income individuals, females, those aged 25-40, and those with chronic diseases or higher education. A positive correlation between headache disability and cognitive distortions was found. Thus, previous research supports my findings and offer more evidence of the significance.

SECTION B

Table 2: Linear Regression between Cognitive Distortions on severity of migraine.

Variable	R Square	Adjusted R Square	SE	Sig.	B Value	Beta Value
Preoccupation with Danger	.134	.125	.901	.000	.047	.366
$p \leq 0.01$						

Table 2 indicates regression between Preoccupation with Danger on severity of migraine. From the result, it is observed that for preoccupation with danger, R square value is .134, adjusted R square is .125, SE is .901, Sig. is .000, B value .047 and Beta value .366

respectively. This indicates a .366 a mild to moderate predictive ability for the variable. R-square value shows that 13.4% of the variance in migraine severity is explained by the model. A study by Kumari, Singh (2024) found that the number of severe migraine patients was higher and they have higher level of cognitive distortion. The findings align with this study as it supports the idea that cognitive distortions, including preoccupation with danger, contribute to migraine severity, even though other factors also play a role.

Table 3: Linear Regression for Pain Perception Based on Hopelessness and Marriage

Variable	R square	Adjusted R square	SE	Sig.	B value	Beta value
Hopelessness	0.137	0.128	2.200	0.000	0.102	0.370
Hopelessness, Marriage	0.173	0.156	2.165	0.000 0.041	0.103 -0.906	0.372 -0.191

$p \leq 0.01$

Table 3 indicates regression for Predicting Severity Based on Hopelessness and Marriage. From the result, it is observed that 13.7% of its variance in negative emotionality is explained by the model. The B value is .102 and Beta value is .370 respectively. Research by Haratian, Amjadi et al., (2020) concluded that weak emotional regulation and repetitive negative thinking are associated with migraine and, especially tension headaches, this study supports the finding by negative cognitive patterns could contribute to emotional distress. When marriage is added as a predictor, slightly improving the correlation (R square = .173), meaning 17.3% of variance in negative emotionality is now explained by the model. B value is .103 for hopelessness and -0.906 for marriage. Beta value is .372 and -0.191 for hopelessness and marriage respectively. The increase in R square indicates the marital status contributes to emotional well-being but does not fully account for the relationship.

Another study by Buse, Fanning et al., (2019) reported relationship issues, career impacts-32.7%, and financial worries-32.1%. Gender differences were minimal, but the impact was more severe for those with migraine, this study further supports the inclusion of marital status as a predictor in this model.

SECTION C

Table 4: Mean, standard deviation and t value based on the family history of migraine sufferers

Variable	Family History (N=54)		No Family History(N=46)		t value
	MEAN	SD	MEAN	SD	
Persistence	2.35	.705	1.93	.854	.726**
Severity	2.02	.921	1.93	1.020	.469
Duration	.28	.452	.28	.455	.176
Frequency	.37	.487	.22	.417	.335
Interference	6.50	2.187	5.59	2.918	1.928
Resistance	2.24	1.045	2.17	1.060	.486
Control	4.09	1.336	4.02	1.453	.625
Negative Emotionality	3.81	2.403	2.89	2.223	1.848*
Self-Criticism	20.35	7.469	18.72	6.568	4.449
Self-Blame	21.81	7.486	20.50	7.296	4.261
Helplessness	22.11	7.728	20.67	7.276	4.433
Hopelessness	20.67	8.290	18.41	8.757	5.641
Preoccupation With Danger	21.39	7.272	20.52	7.682	3.839

** $P \leq 0.01$ * $P \leq 0.05$

Table 4 presents the mean, standard deviation and t-values for various dimensions of pain perception and cognitive distortions based on family history of migraines. Here persistence shows a significant difference indicating that individuals with a family history of migraine (M=2.35, SD=.705) experience more persistent pain compared to those without a family history (M=1.93, SD=.854). This suggests that family history plays a significant role. Negative emotionality also shows significance of .049, implying that migraine sufferers with a family history (M=3.81, SD=2.403) experience higher emotional distress than those without (M=2.89, SD=2.223). However, other variables do not show any significant differences ($p>0.05$), even though no significant relationship is found these variables do play a very crucial role in migraine sufferers.

A study conducted by Pelzer, Louter et al., (2019) showed that migraine days per month were associated with family history in males, but not in females. A stronger family history was also linked to earlier age-at-onset, migraine with aura, and higher medication use, but not to depression. Study suggested that genetics play a role in specific migraine features, particularly in males.

Table 5: Mean, standard deviation and t value based on the marital status of migraine sufferers

Variable	Married (N= 42)		Unmarried (N= 58)		t value
	MEAN	SD	MEAN	SD	
Persistence	2.17	.824	2.16	.790	.335
Severity	1.93	.997	2.02	.946	.300
Duration	.29	.457	.28	.451	.192
Frequency	.29	.457	.31	.467	.161
Interference	5.90	2.685	6.21	2.511	.737
Resistance	2.02	1.115	2.34	.983	.097
Control	3.98	1.405	4.12	1.377	.414
Negative Emotionality	3.90	2.583	3.02	2.123	1.823
Self-Criticism	18.40	6.522	20.47	7.394	.771
Self-Blame	20.21	6.874	21.93	7.723	1.250
Helplessness	20.88	7.296	21.86	7.715	2.0052
Hopelessness	19.52	8.503	19.71	8.639	3.268
Preoccupation With Danger	19.24	7.457	22.26	7.225	.076*

* $p \geq 0.05$

The table 5 presents the mean, standard deviation and t values for various dimensions of pain perception and cognitive distortions among married and unmarried migraine sufferers. The results indicate no significant differences in any variables except preoccupation with danger, with unmarried individuals showing preoccupation with danger (M=22.26, SD=7.225). Overall, while marital status doesn't impact pain perception significantly, it may play a role in specific cognitive distortions and emotional responses among migraine sufferers.

A study by Wachholtz, Bhowmick et al., (2017) examined the impact of migraine frequency on spouse/partner relationships and psychological distress, they found that higher migraine frequency worsened relationship strain, with breakups increasing from 4%-8%. While marriage itself does not directly affect pain, relationship dynamics and negative emotionality can influence how migraine sufferers experience their condition.

Table 6: Mean, standard deviation and t value based on the work-status of migraine sufferers

Variable	Working (N= 50)		Non-Working (N= 50)		t value
	Mean	Sd	Mean	Sd	
Persistence	2.10	.789	2.22	.815	.198
Severity	2.00	.948	1.96	.989	.424
Duration	.18	.388	.38	.490	.025*
Frequency	.24	.431	.36	.485	.062
Interference	5.80	2.611	6.36	2.538	.462
Resistance	2.08	1.027	2.34	1.062	.155
Control	4.18	1.289	3.94	1.476	.790
Negative Emotionality	3.70	2.418	3.08	2.275	1.552
Self-Criticism	20.08	6.577	19.12	7.588	3.778
Self-Blame	21.68	6.897	20.74	7.897	3.882
Helplessness	22.16	6.867	20.74	8.129	4.406
Hopelessness	20.72	7.892	18.54	9.090	5.558
Preoccupation With Danger	20.92	6.797	21.06	8.097	2.827

* $P \geq 0.05$

Table 6 presents the mean, standard deviation and t values for various dimensions of pain perception and cognitive distortions among working and non-working women. The table shows no significant differences in most variables ($p > 0.05$). However, duration shows a significant difference, this suggests that duration is more in non-working women ($M = .38$, $SD = .490$). In contrast to the result, a study by Mäki, Vahtera (2008) analyzed 27,127 female public-sector employees to examine the impact of migraine and co-existing conditions on sickness absence over three years. The findings indicated that migraine is an independent risk factor for increased sickness absence.

CONCLUSION

With migraines becoming increasingly prevalent due to various factors, researchers are now focusing on both psychological and physiological aspects of the condition.

This study aims to understand the Cognitive Distortions and Pain Perception and its relation to Migraine Intensity, the major findings as follows:

- 1) Cognitive distortions play a major role in shaping pain perception in migraine sufferers.
- 2) Negative emotionality shows correlations across multiple pain dimensions, making it a key factor in migraine.
- 3) Preoccupation with danger is linked with migraine severity, suggesting fear-based thinking contribute to migraine.
- 4) Hopelessness and marital status influence negative emotionality, with marriage supporting well-being but not fully explain the connection.
- 5) Individuals with family history of migraine report higher pain perception and negative emotionality than those without. Early exposure to migraine can heighten pain sensitivity and anxiety. Repeated distress may amplify negative emotions, worsening pain perception.
- 6) Unmarried individuals show higher pre-occupation with danger due to more uncertainty and lack of emotional or social support, they feel more isolated and self-reliant, increasing vigilance towards potential threats.

- 7) Work status affects pain perception in terms of duration, non-working individuals experience more duration due to lack of structured routines, high stress from financial dependency or more emotional distress.

Limitations and Suggestions

This study is focused on several aspects such as family history, marital status, work status of the individuals. Other influential factors the impact of cognitive distortions and pain perception in migraine sufferers could be focused on in future studies. The sampling method could be improved to a more diverse and representative sample enhancing reliability. Early therapeutic interventions should be explored potentially reducing the long-term impact. Addressing stigma around pain perception is crucial for improving patient outcomes as they may underreport or exaggerate cognitive distortions or pain levels due to personal bias or social desirability. Including both male and female participants in future studies could provide broader comparative analysis. Future research could explore CBT, mindfulness and other therapies in reducing pain perception and cognitive distortion in migraine sufferers.

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Conflict of Interest

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