

Oregano aromatherapy as support management in alleviation of depression: A prospective-interventional study

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ABSTRACT

Managing stress and having a positive uplifting of mood and promoting relaxation makes aromatherapy a great alternative treatment for depression. It has also been shown to improve sleep quality, decrease stress levels, and aid in pain relief. Using essential oils is not meant to replace medical attention, but oils paired with therapy, medicine, or lifestyle changes can greatly help mental wellness. One of the biologically active medicinal herbs is *Origanum vulgare* L. (*O.vulgare*) of the Lamiaceae family, which is reported to have multiple biological activities. Recent studies have shown in- vivo using oregano essential oil showed increased vigor and lowered stress levels in patients suffering from anxiety and depression. In this study, the objective was to evaluate the potency of inhalation intervention of volatile oil of *O. vulgare* in human depression using the conventional PHQ-9 ("Patient Health Questionnaire-9") and PROMIS depression scale. Aromatherapy study results suggest that essential oils help in treating depression in over 136 days. With these observed outcomes, aromatherapy was proven to be effective as a supplementary treatment throughout this study.

Keywords: Aromatherapy, depression, Lamiaceae, Oregano, *Origanum vulgare*

INTRODUCTION

One of the main causes of disability is depression, which affects 4.4% of young people in the United States (USA) and 57 million people in India, which makes up 18% of the world's population. For clinical depression, Western medicine often recommends psychotherapy and selective serotonin reuptake inhibitors (SSRIs); however, when these approaches don't work because of side effects or patient noncompliance, other medications are

frequently employed (Saeed *et al.*, 2019; Haller *et al.*, 2019). One possible non-pharmacologic approach that has received a lot more attention recently is aromatherapy. Aromatherapy is the application of essential oils for medicinal purposes. When essential oils are inhaled, the aroma molecules reach the brain straight from the olfactory nerves, particularly affecting the brain's emotional center, the amygdala. In general, essential oils are thought to have mood-altering, relaxation-enhancing, anxiety-reducing, and

stress-reduction properties that may help cure depression (Tan *et al.*, 2023). The essential oil content of *Origanum vulgare* L. (*O. vulgare*), a significant medicinal herb in the Lamiaceae family, has been shown to exhibit a range of biological effects (Marrelli *et al.*, 2016). In traditional phytotherapy, *O. vulgare*, a fragrant Mediterranean herb, is extremely beneficial. Its medicinal significance stems from its historical use in the treatment of many ailments such as headaches, depression, pruritus, menstruation complications, cold, whooping and convulsive cough and gastrointestinal disorder (Fikry *et al.*, 2019; Lombrea *et al.*; 2020; Singh *et al.* 2024). Most of the research on this species of plant has focused on its antibacterial, antifungal, and anti-inflammatory qualities instead of how it directly affects mood. Over the past years, few *in-vivo* studies have assessed the effects of oregano essential oil in anxiety and depression and has been reported to elevate vitality and decrease stress (Amiresmaeli *et al.*, 2018; Capatina *et al.*, 2021). This study analyses the efficiency of volatile oil of *O. vulgare* inhalation in treating depression in test subjects using the often utilized PHQ-9 ("Patient Health Questionnaire-9") and the PROMIS (Patient-Reported Outcomes Measurement Information System) depression scale (Kroenke *et al.*, 2021).

MATERIALS AND METHODS

Ethical approval

All the protocols used in current study were carried out in compliance with the Helsinki Declaration and its subsequent revisions. The study was approved by the Institutional Ethics Committee of Chitkara University, Faculty of Pharmacy (Protocol no. EC/NEW/INST/2023/531/254A).

Study Design

This prospective-interventional study was conducted in 2024 at different rural and urban regions of Patiala district of Punjab including of Rajpura, Banur, Kalomajra,

Ramnagar and Chitkara University, Punjab, India. The focus was to study the effect of *O. vulgare* aroma therapy on stress (personal and professional related stress) and depression. The study population comprised of general population (Housewives, shop owners, workers on daily wages) and some faculty members of different schools and colleges of Chitkara University, Punjab, India, who met the inclusion and exclusion criteria for the study. Informed consent was taken from the subjects before participation in the study. (In English, Hindi and Native Language). The sample size was calculated by epi info, as (n) 207 with 95% Confidence Interval of the study and 5 % margin of error. The alpha level of the study was considered as $p = 0.05$.

Inclusion and Exclusion criteria

The housewives, shop owners, workers on daily wages and working professionals of Chitkara University, Punjab who were aged 18 years to 55 years (male and female) and were willing to participate in the study were included. They were screened for the stress and depression symptoms in accordance with PROMIS and PHQ Rating scale. The pregnant women employees, individuals with co-morbidities associated with brain, skin and mood disorders as well as individuals involved in the participation in another interventional study, within past 3 months were excluded from the study.

Intervention

Aromatherapy was administered for a total duration of 4.5 months, using *O. vulgare* essential oil, known for their stress-relieving properties. Participants received aromatherapy sessions under standardized conditions, ensuring consistency in exposure. Initially during first 3 sessions of aromatherapy, 2 to 3 drops of oil were applied on forehead and was gradually increased to 4 to 5 drops during the rest 7 sessions of the therapy. The participant underwent a total of 10 intervention

sessions, with the overall duration segmented into distinct phases. Initially, the intervention was divided into two primary phases, Phase I and Phase II, to determine which phase produced a more significant effect on the participant's health. Subsequently, the results of the transition from Phase I to Phase II were evaluated, followed by an analysis of the effects from Phase II to Phase III. Finally, to assess the overall impact, the cumulative effect from Phase I to Phase III was statistically analysed, with all findings detailed in the results section.

Measuring Tools

Depression scales

To reach a diagnosis, a thorough clinical evaluation that includes a detailed interview, symptom assessment, and consideration of other criteria is required; hence, a single scale or questionnaire is often insufficient. Therefore, the level of depression in the study participants was assessed using two commonly used published questionnaires: PROMIS Emotional Distress– Depression – Short Form (Level -2 Depression) and Patient Health Questionnaire -9 (PHQ-9).

Patient Health Questionnaire -9 (PHQ-9)

In order to evaluate the severity of depression, it is often useful to employ self-administered questionnaires like the Patient Health Questionnaire 9 (PHQ-9). This specific Questionnaire consists of a set of nine questions regarding the details of suicidal thoughts, levels of exhaustion, disturbances of sleep, depressed moods, and a lack of interest in activities once enjoyed. When factoring in all the items, the total score can range between 0 to 27, categorizing depression as none, mild, moderate, and severe. The scoring methodology of each item ranges from “not at all” to “almost every day” which is a range from zero to three. Because of its high accuracy, simple practicality, and capability for longitudinal analysis, it is

popular in both clinical and investigative environments (Ford et al., 2020).

PROMIS Emotional Distress – Depression – Short Form (Level -2 Depression)

The NIH created the PROMIS Depression Scale to determine depressive symptoms in multiple populations. It does not measure grade depression, instead measures factors of emotional pain such as sadness, social withdrawal, and feelings of worthlessness. PROMIS is useful in evaluating the results of research studies as well as longitudinal changes in symptoms over time. It's systematic scoring system improves the reliability of research and clinical assessments which boosts the effectiveness of evaluations of treatment outcomes even for aromatherapy (Kroenke et al., 2021).

Statistical Analysis

Both analysis and description are provided for the results of the current research. The sample population's data was revealed to be normally distributed so a parametric test could be opted. To assess the difference in means owing to the effect of *O. vulgare* essential oil through aromatherapy on depression, a paired T-test was carried out.

RESULTS AND DISCUSSION

Phase I

The duration of this phase extended over sixty-one days from 15-August 2024 to 15-October 2024. The PHQ-9 and PROMIS questionnaire for assessing depression severity was provided to all the study participants pre and post aromatherapy. The significant reduction ($p = 0.001$) was seen in the PHQ-9 scores of participants post aromatherapy ($M = 15.4$, $SD = 3.43$) in comparison to pre-aromatherapy ($M = 22.3$, $SD = 2.28$) scores. Similarly, there was a significant drop $t(199) = 54.61$. ($p = 0.001$) in PROMIS Questionnaire scores of study participants post aromatherapy ($M = 18.02$, $SD = 3.52$) in contrast to the pre

aromatherapy scores ($M = 26.49$, $SD = 3.56$). the results were found significant as $t(199) = 56.02$, $p = 0.001$. The analysis of PROMIS Questionnaire for the study participants for Phase I has been presented in table 1 and graphically in Figure 1.

Phase II

The duration of this phase extended over 75 days from 15th October, 2024 to 29th December, 2024. The PHQ-9 and PROMIS questionnaire for assessing depression severity was provided to all the study participants pre and post aromatherapy. The PHQ-9 questionnaire result exhibited significant difference in the scores for the second phase of aromatherapy ($M = 5.60$, $SD = 3.14$) and the first phase of aromatherapy ($M = 15.4$, $SD = 3.43$) conditions; $t(199) = 59.61$, $p = 0.001$. Similarly, PROMIS Questionnaire Result indicated there was a significant difference in the scores for the second phase of aromatherapy ($M = 7.25$, $SD = 3.09$) and the first phase of aromatherapy ($M = 18.02$, $SD = 3.52$) conditions; $t(199) = 66.26$, $p = 0.001$. The analysis of PROMIS Questionnaire for the study participants for Phase II has been presented in Table 2 and Figure 2.

Phase I to III

The total duration of this study extended over 136 days from 15th August, 2024 to 29th December, 2024. The PHQ-9 questionnaire result indicated significant difference in the scores for post aromatherapy ($M = 5.60$, $SD = 3.14$) and pre-aromatherapy ($M = 22.32$, $SD = 2.28$) conditions; $t(199) = 88.26$, $p = 0.001$. The PROMIS questionnaire result showed significant difference in the scores for post aromatherapy ($M = 7.25$, $SD = 3.09$) and pre-aromatherapy ($M = 26.49$, $SD = 3.56$) conditions; $t(199) = 88.0$, $p = 0.001$. The analysis of PROMIS Questionnaire *via* t-Score for Phase I to III of this study and the interpretation of t-scores for PROMIS

Scale has been represented in Table 3 and Table 4 respectively. Post oregano aromatherapy, the significant shift in the t-score values were noted with most subjects having t-score of < 55 . The pre and post therapy scores reduction *via* PHQ-9 scale and PROMIS scale has been represented in Figure 3 & Figure 4 respectively. Both the scales showed reduction in the mean values. Additionally, figure 5 denotes study population with their t-score in PROMIS Scale for Phase I to III of study. These results from the scores from both the questionnaires indicate the effectiveness of essential oil in the management of depression.

Results showed that depression scores significantly decreased after the intervention, implying that *O. vulgare* may be effective in reducing emotional discomfort. Since both Phase I and Phase II transitions showed significant symptom reduction, data also indicated that benefits were different between stages, supporting the idea that exposure to aromatherapy over time intensifies therapeutic effects. Numerous chemical moieties belonging to the terpenes and terpenoidal groups have previously been documented in published literature for their effectiveness against depression, having been found in the volatile oil of *O. vulgare*. Among the examples are sesquiterpenoids (β -caryophyllene), bicyclic monoterpenes (α -pinene, borneol), acyclic monoterpenes (geraniol, linalool), and monocyclic monoterpenes (thymol, carvacrol) (Singh *et al.* 2024). Together these might perform neurotransmitter-modulating, anti-inflammatory, and antioxidant activities to fight depression. According to research, carvacrol is beneficial in the central nervous system (CNS), and that could be the reason why it has potential antidepressant properties. It's also been proved that carvacrol modulates neurotransmitter systems, such as serotonin, which is essential to mood regulation (Imran *et al.*,

2022). Thymol has been mentioned to be neuroprotective and can act in GABAergic modulation, which could account for calming effects on the nervous system (Banerjee *et al.*, 2022). Para-cymene reportedly attenuates the symptoms of anxiety and depression through modulation of receptor signaling pathway, neuron projection, and neuroactive ligand-receptor interaction (Khanh *et al.*, 2024). Widely known for its relaxant, anti-anxiety, and mood elevating capabilities, linalool has direct effects on the GABAergic system, which helps with relaxation, great contribution towards anxiety and depression alleviation (De Lucena *et al.*, 2020). Also, gamma-terpinene, which is a monoterpene antioxidant, is believed to play a role in elevating the mood through oregano oil. It may improve mental health indirectly, including depression, through reducing oxidative stress (Amiresmaeili *et al.*, 2018). These elements working together may be the cause of improved mood and reduction of depression symptoms. More research is needed, as many of the ingredients incorporated in the essential oils or whole plant extracts have not been tested adequately in depression models. For example, they found that terpene carvone and glycosylated flavonoid linarin had a pretty good antidepressant principle; however, the actual mechanism of action is still not known (Guzmán-Gutiérrez *et al.*, 2023; Fonseca *et al.*, 2023). Gamma-terpinene, believed to be a monoterpene with antioxidant qualities, is also considered a contributor to the ability of oregano oil to elevate mood. It may indirectly improve mental health, including depression, by reducing oxidative stress. These elements working together may be the cause of improved mood and reduction of depression symptoms. There is room for more research because many of the ingredients included in the essential oils or whole plant extracts have not been thoroughly tested in depression models. For

example, terpene carvone and glycosylated flavonoid linarin were revealed to have a good antidepressant principle, however their exact mechanism of action is yet unknown. The effectiveness of hispidulin (a flavonoid) and its associated processes in depressive disorders can be investigated further. It has been shown to improve social withdrawal behavior in mice (Mouri *et al.*, 2020).

Limitations

The population being studied in this study is diverse in terms of age, gender, and ethnicity. As a result, various populations and environmental condition may produce different results. *O. vulgare* is a rather diverse species. Geographical locations, environmental conditions, and climate all have a considerable impact on the makeup of its essential oils. For a meaningful link with its diverse biological activities, it is essential to standardize its volatile oil content and extracts unique to each place based on primary components.

CONCLUSION

The overall findings of this study are in favor of using aromatherapy as a supplemental treatment for depression. Given the notable decline in depression scores, *O. vulgare* aromatherapy may be a safe, all-natural way to enhance mental health, especially in high-stress settings like corporate offices, educational institutions, and many more.

CONFLICT OF INTEREST STATEMENT

The author declare that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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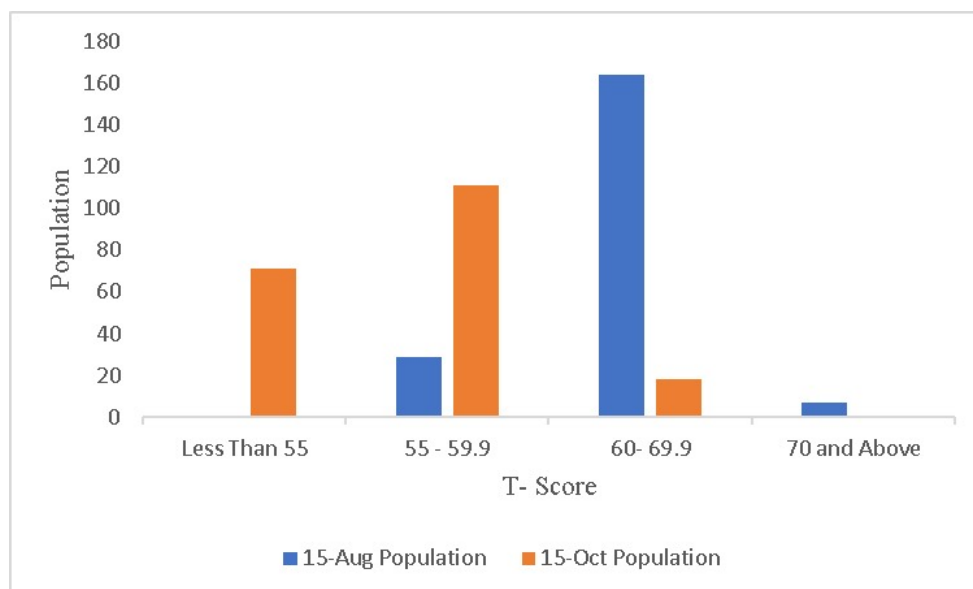


Figure 1: Graphical representation of population with their t-Score in PROMIS Scale for Phase I to II of study.

Table 1: Analysis of PROMIS Questionnaire *via* t-Score for Phase I

t- score	15 th August, 2024	15 th October, 2024
	Population	Population
Less Than 55	0	71
55 - 59.9	29	111
60 - 69.9	164	18
70 and above	7	0

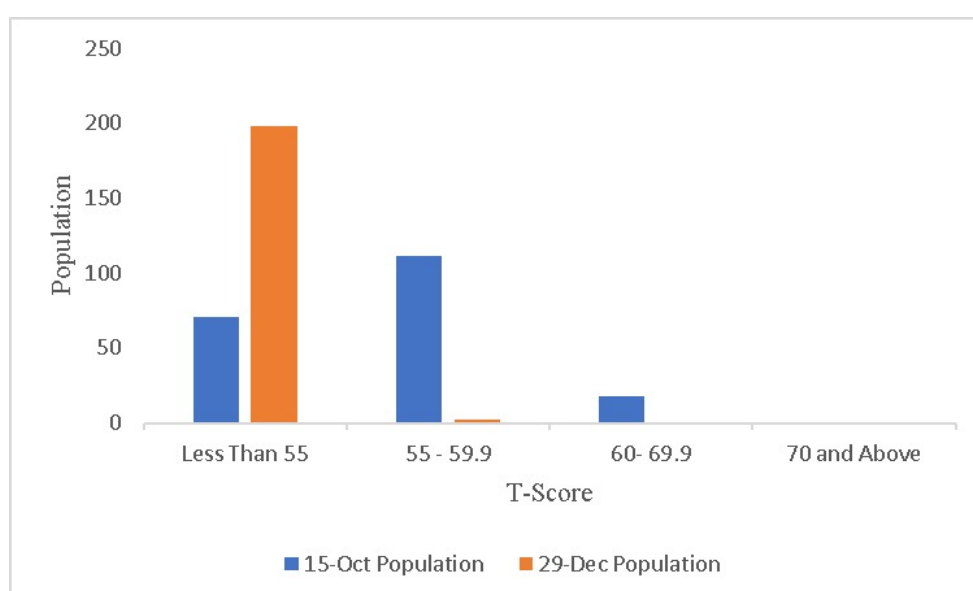


Figure 2: Graphical representation of population with their T-Score in PROMIS Scale for Phase II to III of study.

Table 2. Analysis of PROMIS Questionnaire via t-Score for Phase II:

t- score	15 th October, 2024	29 th December, 2024
	Population	Population
Less Than 55	71	198
55 - 59.9	111	2
60 - 69.9	18	0
70 and above	0	0

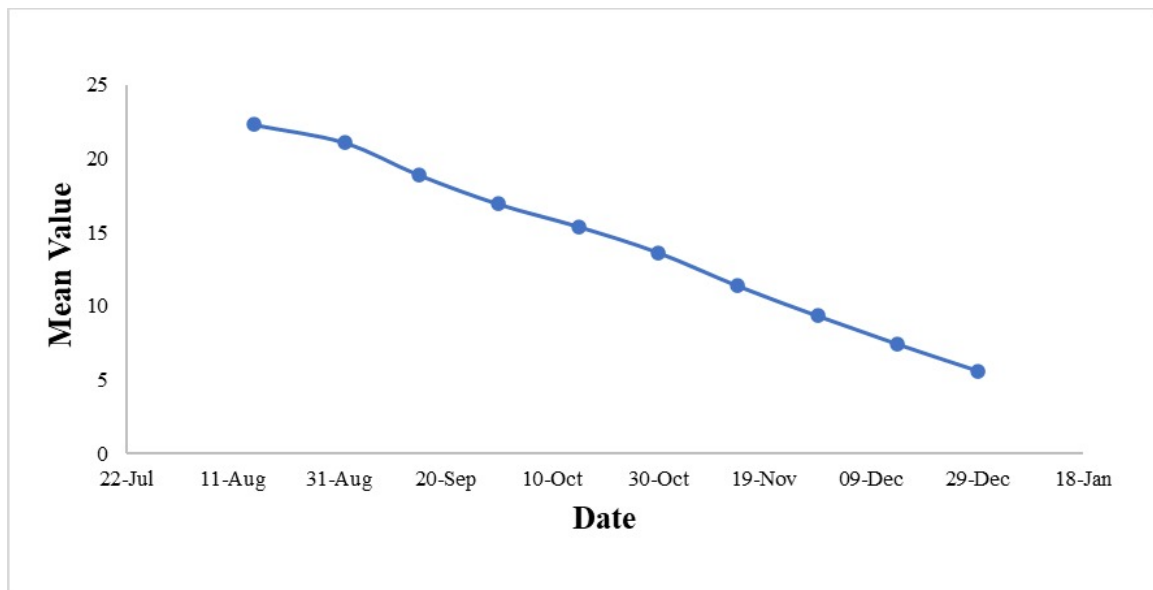
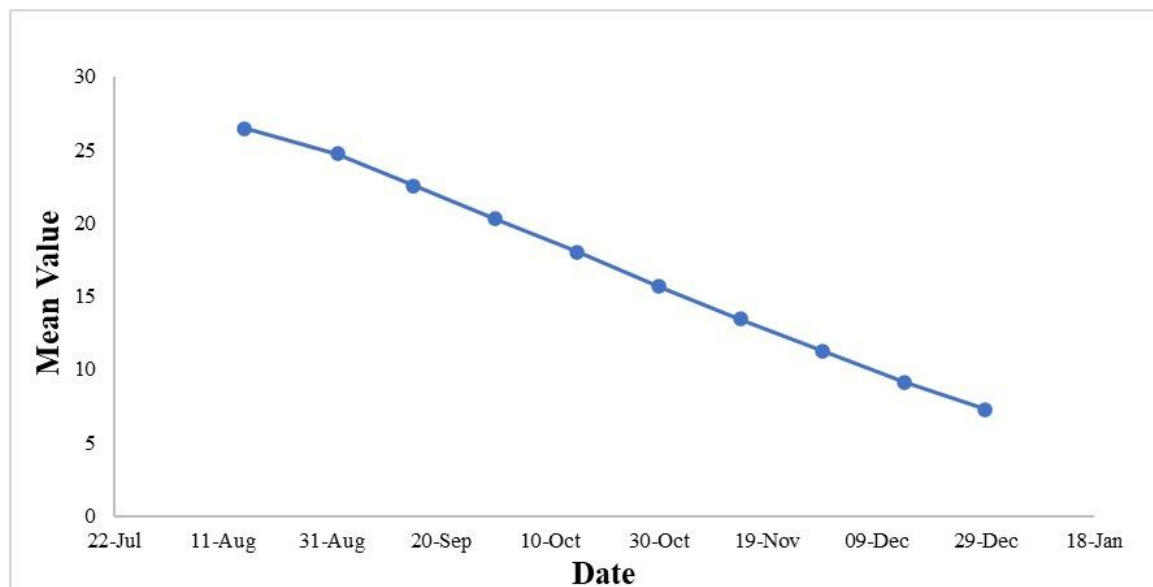
**Figure 3: Graphical representation for pre and post therapy scores reduction via PHQ Scale.****Figure 4: Graphical representation for pre and post therapy scores reduction via PROMIS Scale.**

Table 3: Analysis of PROMIS Questionnaire *via* t-Score for Phase I to III

t- score	15 th August, 2024	29 th December, 2024
	Population	Population
Less Than 55	0	198
55 - 59.9	29	2
60 - 69.9	164	0
70 and above	7	0

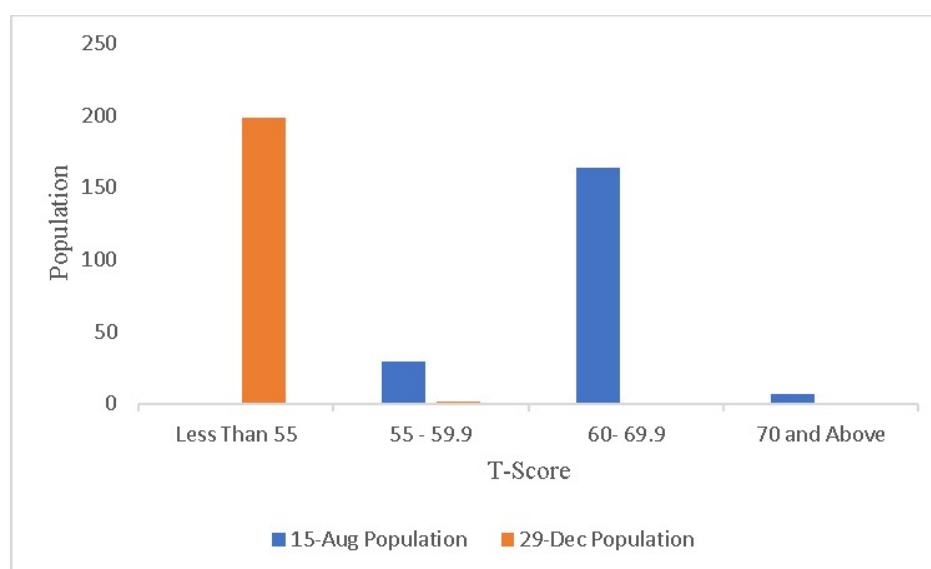


Figure 5: Graphical representation of study population with their t-score in PROMIS Scale for Phase I to III of study.

Table 4: Interpretation of t- scores for PROMIS Scale

T-Score	Interpretation
Less than 55	None to Slight Depression
55.0 – 59.9	Mild Depression
60.0 - 69.9	Moderate Depression
70 and above	Severe Depression