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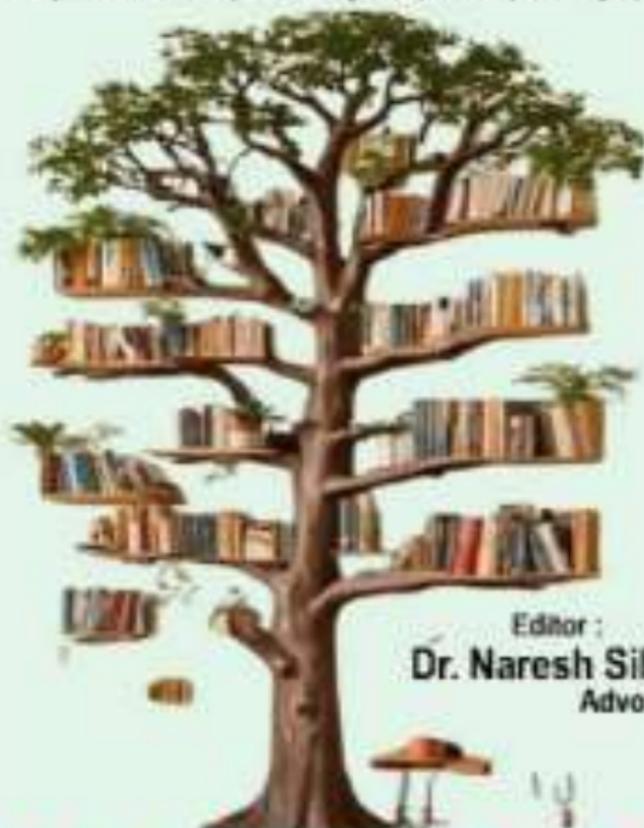
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## From Vision to Implementation : Nep 2020 and The Evolution of Teacher Education Policy in India

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### Abstract

The National Education Policy (NEP) 2020 marks a radical shift in the teacher education landscape in India, reflecting a fundamental vision based on holistic, multidisciplinary, and learner-centred principles. This article discusses the evolution of teacher education policy from the post-independence of various institutions and gradual implementation, with a particular focus on the issues of multidisciplinary learning and widening professional development. It explores how the NEP 2020 redefines the role of the educator, no longer as a mere disseminator of knowledge, but as a facilitator of inquiry, creativity, and holistic learning. Through a critical analysis of policy documents, institutional reforms, and digital tools such as [NCERT](https://www.ncert.nic.in/) and [NEP](https://www.nep.gov.in/), the study traces the journey from policy formulation to implementation, exploring structural innovations such as the integrated Bachelor's Bachelor of Education program, curriculum integration across disciplines, and adaptive pedagogies. The article also addresses implementation barriers, such as NEP's emphasis on continuous evaluation, and digital integration, while proposing strategic systems for scalable teacher capacity building.

Ultimately, this research highlights the need to develop agile and empowered teachers who are not only competent in disciplinary knowledge and pedagogy, but also sensitive to socio-practical learning, ethics, and digital literacy. In doing so, it explores teacher education as a fundamental pillar in advancing the NEP 2020 vision, equitable, quality education for all.

**Keywords:** NEP 2020, Teacher Education, Evolution of Teacher Education Policy, Multidisciplinary and Holistic Pedagogy

### Introduction

"The highest education is that which does not merely give us information, but makes our life a harmony with all existence." – Mahatma Gandhi  
Education is more than the transfer of knowledge—it's a holistic force that shapes the physical, emotional, and moral growth of individuals. It nurtures our ability to live in harmony with ourselves, others, and the world around us. In India, education has long been seen as a key to personal and societal transformation. Guided by Gandhi's vision of creating Indian education systems that propagate values, justice, and holistic development, aiming to uplift individuals and build a more harmonious society.

The National Education Policy (NEP) 2020 marks a transformative milestone in India's educational landscape, introducing broad changes designed to improve the quality and accessibility of learning at every level. A key area of focus within this policy is teacher education, which has long struggled with fragmented standards, insufficient pedagogical training, and inconsistent institutional governance. By redefining education as a holistic pursuit of educational quality, NEP 2020 promotes integrated, multidisciplinary teacher training programmes, unified regulatory measures, and alignment with national educational objectives.

The new National Education Policy (NEP) 2020 sets an urgent and comprehensive agenda for the Education System (Pre-Primary to Higher Education) of India. The government of India has decided to take the recommendation of the policy by 2025. The core objective of the

new efforts to to achieve high quality education for learners and access to high educational standards in general. NEP 2009 emphasises the need to concentrate on teacher education. Initiatives (2004) and subsequent Teacher Education (TE) programs by 2010, are including a comprehensive strategy for teacher recruitment and training, which will generate the required number of TE Educators and Colleges.

#### **Nurtal Commission: Foundational Recommendations and Practical Challenges in Teacher Education**

The Nurtal Commission of 1980, also known as the Indian Education Commission, marked one of the earliest efforts to improve education policy in general India. Although its main focus was on primary and secondary education, it indirectly shaped teacher education by advocating for the growth of vocational schools and emphasising the need for trained educators to support vocational learning. The commission underscored the role of the education in societal advancement, proposed the establishment of Special Schools for severely handicapped education, proposed the establishment of Special Schools for severely handicapped teacher training, and highlighted the importance of structured preparation. Yet, the realities on the ground were far from ideal—teacher education was basic, unevenly distributed in strict regions, and severely under-resourced. Training institutions faced gaps in strict pedagogy, and learning was often viewed as a low-profile profession. The current program, structured where possible, across five educational systems, resulting in fragmented and uneven teacher preparation. These gaps ultimately paved the way for later initiatives, such as NEP and OERs, to address the challenges in professionalisation and systemic reform. In general, NEP 2009's focus on integrated, multidisciplinary, and professional teacher education needs to address and rectify the fundamental issues first identified during the Nurtal Commission's era.

#### **Indian University Commission (IUC): Cultural Influences and Systemic Gaps in Teacher Education**

Formed during Lord Curzon's tenure, the Indian University Commission of 1902 aimed to reform higher education institutions across colonial India. Although teacher education wasn't its primary focus, the commission indirectly improved it by stressing the importance of standardised university governance, academic excellence, and professional certification for educators. It called for improved training of university faculty and the creation of regulatory frameworks to uphold educational standards. Yet, the prevailing colonial agenda shaped the process—teacher education remained fragmented, poorly integrated with university systems, and largely unlinked to local needs and pedagogical efficiency. The commission's proposals did little to shift school-level teacher training, which continued in isolation with limited pedagogical advancement. These shortcomings reflect a broader colonial neglect of teacher education as a distinct and vital profession—a gap that later bodies like the Kothari and Chatterjee Commissions aimed to bridge. In contrast, NEP 2009's push to embed teacher education within multidisciplinary universities marks a significant and explicit move toward systemic integration and professional recognition, addressing the fundamental deficiencies first raised during the Indian University Commission's era.

#### **Radhakrishnan Commission: Higher Education and Teacher Preparation Realities**

The Radhakrishnan Commission (1948-50), formally known as the University Education Commission, was a landmark post-independence initiative aimed at reforming higher education in India. While its primary focus was on university-level education, it made significant recommendations regarding teacher qualifications, academic standards, and the professional status of educators. The commission emphasised that teachers should be professionally competent, ethically grounded, and socially responsible, advocating for intellectually rigorous, vertically-oriented, and continuous professional development. It also recognised that teacher education be integrated into university systems to ensure parity with other professional disciplines. However, the ground realities at the time were challenging—teacher education remained fragmented, underfunded, and largely disconnected from university-level higher education. Many institutions lacked qualified faculty, and pedagogical training was often disconnected with little classroom relevance. These structural barriers limited the realisation of the commission's vision. Today, NEP 2009's push for integrated, multidisciplinary teacher education within universities echoes the Radhakrishnan Commission's explicit vision to bridge the historical gap between policy aspirations and practical implementation.

#### **Mudaliar Commission (1952-53): Vision vs. Reality in Teacher Education**

The Mudaliar Commission (1952-53), formally known as the Secondary Education Commission, played a crucial role in shaping India's secondary education framework, although its primary emphasis was on curriculum and structural reform, it acknowledged

**Innovation: The Research Concept**

The crucial role of teachers in driving educational quality. The commission recommended reforming both pre-service and in-service teacher training, setting clear professional standards for teachers, and creating policies to support educational innovation and student guidance. It also envisioned teachers as school leaders capable of fostering innovation and student-centered environments, particularly within multipurpose institutions. However, the representation-based approach to teacher training involved limited academic rigor and quality, leading to a skills gap in subject preparation. Training programs were often overly theoretical, with minimal classroom engagement, and the integration of academic education remained largely superficial due to insufficient teacher readiness. These gaps between policy and practice limited the transformative potential of the commission's vision, leaving teacher education fragmented and unable to meet national goals.

**Rajiv Commission: Vision and Ground Realities in Teacher Education**

The Rajiv Commission (1991-92) marked a turning point in Indian education, formally asserting that India's future is shaped in her classrooms. It championed the professionalization of teaching through academic excellence, targeted training, and lifelong in-service development. Despite its visionary goals, implementation was hindered by poor infrastructure, uneven access—especially in rural areas—and a shortage of qualified educators. These systemic issues posed a significant challenge to the commission's integrated teacher education, digital focus, and regulatory reforms. The commission's enduring influence highlights the need to align and focus policies with practical, inclusive strategies.

**Chattopadhyay Commission: Reconceptualizing and Ground Realities in Teacher Education****Education**

The Chattopadhyay Commission (1991-95) emphasized elevating the teaching profession through a unified framework of pre-service, in-service, and in-school learning. It called for academic excellence, ethical accountability, and integration of teacher education into universities for greater rigor and parity for societal challenges—such as poor infrastructure, unqualified faculty, and fragmented in-service programs—underscored its vision. The commission also linked education to career growth. Many of its recommendations resonated in NEP 2020, which aims to embed teacher education within multidisciplinary colleges and promote continuous professional development in a more holistic system format.

**NEP 1986: Vision and Ground Realities in Teacher Education**

The National Policy on Education (1986) recognized teacher education as vital and proposed the National Council for Teacher Education (NCTE) to regulate standards and quality. It stressed pre-service and in-service training, institutional development, and professional growth. Yet, implementation faced hurdles—many TEIs lacked infrastructure, skilled faculty, and relevant curricula, while in-service programs were disconnected and detached from classroom needs. Regional imbalances and administrative delays further impeded progress. NEP 2020 builds on this legacy, aiming to overcome these gaps through integrated, tech-enabled, and sustained teacher development strategies.

**National Knowledge Commission: Vision and Ground Realities in Teacher Education**

The National Knowledge Commission (2002) sought to transform India into a knowledge-driven society with teacher education as a key focus. It recommended increasing institutional quality, integrating training with higher education, and promoting autonomy. ICT use and research-based programs (DIPICs) in NCTE's vision. Many TEIs continued to face poor academic standards, unqualified faculty, and limited ICT adoption—especially in rural areas. Poor coordination among regulatory bodies and inadequate funding further hindered progress. NEP 2020 echoes NKC's goals, aiming to modernize teacher education through digital tools, integrated programs, and competency-based approaches, leading NKC's vision to light new horizons.

**Objective of study**

1. To explore NEP 2020's vision for teacher education.
2. To assess the changes in teacher education policies over time.
3. To identify key challenges in policy execution.

**Scope of Literature**

The literature on teacher education in India is deeply rooted in national policy-making and implementation paradigms. This review synthesizes key historical

policy, and subsequent issues that have shaped the trajectory of teacher education, especially in light of the National Education Policy (NEP) 2010.

#### Statistical Correlations and Policy Decisions

Waller (2007) questioned the need for teacher education in primary education, through statistical analysis and across national borders.

Kaplan (2007) addressed the need for intellectually and morally empowered teachers, but evoked and identified social systems constraints.

Waller (2007) also argued needed that the teaching of NEP is being taught in the classroom, using a contextualized approach to teacher education.

National Policy on Education (NPE) provided the establishment of the National Center for Teacher Education (NCTE) to regulate standards and process in teacher training.

#### Contemporary Research and Analysis

Mishra (2010) in her paper published in *JITE*, offers a comprehensive analysis of NEP 2010's recommendations and challenges concerning teacher education. Her work emphasizes the shift towards integrated teacher education programs, the role of multidisciplinary institutions, and the intellectual and pedagogical reforms necessary for quality enhancement. The study also highlights systemic issues such as content overload and lack of innovation in teacher training modules.

Waller (2007) writing in *VOYA* – A Journal of Open Inquiry, explored innovations and reforms in teacher education aligned with NEP 2010. His paper addresses the importance of technology integration, continuous professional development (CPD), and the restructuring of teacher education institutions into multidisciplinary hubs. The emphasis on digital platforms like *SWAYAM* and *ODISHA* for inclusive learning is particularly relevant to the evolving educational landscape.

Wang & Deaton (2002), in the *International Journal of Educational Research* in Human and Social Sciences, look at the future trajectory of teacher education under NEP 2010. Their work discusses the restructuring of B.Ed. programs, the role of regulatory bodies like NCTE and AICTE, and the influence of local knowledge systems and innovative educational practices. The paper also reflects on the policy's potential to democratize access to teacher education, especially for candidates from rural and tribal areas.

#### Digital Integration and Lifelong Learning

NCTE (2007) introduced guidelines for Continuous Professional Development (CPD), encompassing 50 hours of annual training aligned with NEP 2010. Platforms like *SWAYAM* and *ODISHA* have democratized access to teacher training, though the digital divide remains a persistent challenge.

#### Next Step

##### Focus Of Teacher Education in NEP 2020

NEP 2020 recognizes teachers as central to shaping the future of students and society. It emphasizes teacher respect and equity in the profession by offering financial incentives through allowances, especially in rural areas. The policy promotes integrated B.Ed. programs, increases teacher numbers, and enhances management education systems. Teacher Eligibility Tests (TET) and National Professional Standards for Teachers (NPST) are highlighted to ensure quality, while continuous professional development (CPD) focuses on ongoing growth. The overarching goal is to empower teachers with better training, support, and opportunities so they can deliver an effective and holistic education. Teachers need to keep updating their teaching skills to grow professionally. They maintain a class to be share knowledge with students. To do this, they follow a curriculum that's designed according to their skills. They identify and solve their problems during the school year. Teachers also offered methods to teach, like group learning, working with small groups, and using various activities to help students understand better. This can be divided into following categories:

#### Multidisciplinary Training

NSF 2020 encourages a new direction in Teacher Education by focusing on building student learning. This means future teachers are prepared to engage various subjects and study, making them more flexible, diagnostic, and creative in their teaching roles.

**Integrated & EA Programs**

Education systems across the world are changing, and today's NSF 2020 has identified new models to improve the quality of learning. These changes focus on better learning using technology and building strong values and character in students. To support this work, the National Council for Teacher Education (NCTE) has designed rating criteria for both content and character.

Today, students completed a three-year degree followed by a two-year B.Ed program in teacher education. Now, NSF 2020 has introduced a four-year integrated teacher education program, which allows you join right after high school. This way, they earn a Bachelor's Degree and teacher training together.

The program is flexible - students can receive certificates of diploma at different points depending on how far they go. The new curriculum includes a wide range of subjects and aims to help students connect with societal activities. To get into the program, students need to pass the National Common Entrance Test (NCET), conducted by the National Testing Agency (NTA).

**Learning across disciplines**

In today's changing education system, NSF 2020 promotes a multidisciplinary approach in teacher education. This means teachers are trained to understand and apply what they know across subjects - not just one area of study. Such learning helps teachers become flexible, creative, and better prepared to meet the needs of diverse learners. It builds their ability to use real-life examples, knowledge problem-solving, and create inclusive classrooms where every student feels supported. Learning across disciplines also helps students gain skills like critical thinking, better understanding, and collaboration - important for teaching in 21<sup>st</sup> Century Classrooms. By making across subject boundaries, teachers are better equipped to guide students in a well-rounded and meaningful way.

**Building Critical Thinking Skills**

NSF 2020 encourages teachers to help students think, create, question ideas, and solve problems on their own. To make this happen, teacher education programs are being improved so future educators learn how to build these skills in their classrooms. Teachers are expected to go beyond just giving answers - they create learning spaces where students explore, ask "why," and think deeply about what they learn. Through real learning examples, hands-on activities, and use of technology, teachers guide teachers to become confident and thoughtful faces of wisdom.

**Digital Learning Tools in Teacher Education under NSF 2020**

NSF 2020 highlights the importance of using digital tools to make learning more meaningful and effective. Future teachers will be trained to use various methods, and access systems to help students learn better. The policy also focuses on building digital skills like online safety, responsible use of technology, and understanding digital citizenship.

To make this possible, the government and private sector must work together to ensure internet access and provide schools with proper digital devices and resources. Further, school programs will include special sessions on using technology in the classroom so that every student can benefit when they use - not benefit from digital learning.

**Continuous Professional Development in Teacher Education under NSF 2020**

Continuous Professional Development (CPD) refers to the ongoing learning journey of teachers - from their early training days to retirement. NSF 2020 views this journey as a continuous process that includes the pre-service phase (before joining the job), the in-service phase (yearly years of teaching), and in-service professional learning (like online learning).

Regular training is needed to keep up with the fast-changing education landscape.

1. Modeling and learning from other teachers
2. Making connections with teaching
3. Discussing and learning together
4. Finding professional resources and mentors
5. The 2002 standards that highlighted growth comes from both formal programs and informal learning. Teachers are encouraged to regularly update their skills, reflect on their teaching practices, and stay committed to improving student learning. This includes, but is not limited to, peer-review systems and digital platforms like Edmodo, as an important role in facilitating.

**Evaluation of Teacher Education Policy**

**Setting External Policies:** The regulation of formal teacher education was first being set by law, beginning with the Model's Education of 1953, which acknowledged the need for teacher training. This led to the establishment of Normal Schools to train primary teachers. Later, Brazil's 1961 Education Reform (LEI) stressed the importance of continued training and development in teacher education.

**Post-Independence Developments:**

After 1957, several national commissions created teacher education.

The **Radicalization Commission (1959-60)** emphasized the role of qualified teachers in higher education. The **Golden Commission (1964-66)** formally noted that "the destiny of Brazil is being shaped in its classrooms" and called for better paying, job-secure and professional teacher development. The **National Plan on Education (1966)** recognized teacher education as a distinct priority and proposed an advanced study for its expansion.

**International Growth:**

Two major institutions continued to policy implementation:

**UNESCO (1967):** Emphasized a central role in curriculum design and teacher training standards.  
**UNICEF (1968):** Focused on a holistic focus to ensure quality and standards in teacher education programs across Latin America.

**Evolution in the 21st Century & NEP 2020:**

The **National Education Policy (NEP) 2020** marked a major turning point by emphasizing

A teacher's expertise, a 5% increment in the approval qualification by 2025 to meet the use of technology and blended learning, a national-level approach to teacher training, Development of National Professional Standards for Teachers (NPST).

**Key Challenges in Policy Execution**

**Limitations in Institutional Capacity and Infrastructure**

**Policy Execution:** The 2020 NEP requires that teacher training be delivered in multidimensional institutions offering four-year integrated Teacher Education Programs (TEPs).

**Support:** Many institutions, particularly in Tier 2 and 3 regions, lack the infrastructure necessary to support such integration. Basic facilities such as libraries, digital labs, and research centers are often underdeveloped or nonexistent.

**Implementation:** This results in a competition to access to quality teacher training between urban and rural areas, leading to the issue of equitable delivery.

**Curriculum Integration and Pedagogical Developments**

**Policy Expectations:** Shift from rote learning to competency-based, experiential, and multidisciplinary teaching.

**Challenge:** Most teacher education institutions still follow a pattern. Graduate study requires taking five dual or interdisciplinary perspectives (e.g., philosophy of science, pedagogy).

**Consequences:** Teachers may graduate without a solid grounding in core PSE processes, such as interdisciplinary learning or environmental development.

**Teachers' shortages and gaps in professional development**

**Policy expectations:** The SEP emphasizes effective practice, mentoring, and continuing education for teacher education.

**Reality:** There is a shortage of teacher teaching outside of teaching these practices. Many teachers are affiliated with the SEP framework and have not benefited from research.

**Consequences:** Without continuing professional development (CPD, CEP) research, technology and research are not being used to improve practice.

**Tension between standardization and local needs**

**Policy expectations:** Common standards (see the NCTE) for quality education in teacher training.

**Challenges:** Local context makes flexibility, value systems, for example, may require a model or culturally appropriate pedagogy.

**Consequences:** High quality job recruiting requires credentials, which are essential for national and effective education.

**Original Goals in Teacher Training**

**Policy Expectations:** National (see NCTE, 1994), and NCTE standards define and encourage continuing education.

**Reality of the Street**

**Challenges:** Teachers in remote areas often lack relevant content areas of courses. Even when technology is available, digital literacy remains a barrier, especially for older teachers.

**Consequences:** Technological skills remain inaccessible to many, leaving them inexperienced and decreasing motivation.

**Gaps in Assessment and Measurement**

**Policy Expectations:** Centralized systems and standardized systems managed by the NCTE is most prevalent.

**Challenges:** Mechanisms for assessing the impact of reforms, particularly the impact of new pedagogies on student outcomes, are still lacking.

**Consequences:** Without direct feedback loops, it is difficult to effectively evaluate and refine implementation strategies.

**Regulatory Overlap and Confusion in Implementation**

**Reality:** Multiple bodies (NCTE, UGC, NCERT, SCERT, state boards) overlap and issue guidelines, sometimes leading to duplication or contradictions.

**Example:** Disagreement in the Andhra government on teachers because of dual use benefits of education.





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# Gratitude and Gender: A Comparative Study

Dr. Vinay Kumar Singh \*

## Abstract

This study aimed to explore the gender differences in the feeling and expressing of gratitude among undergraduate students. The sample included all first-year students (20 males and 20 females) from Feroze Gandhi College, Rae Bareilly. The Gratitude Questionnaire-6 (GQ-6) of McCullough, Lambert and Tsang (2002) was used to measure the gratitude of the respondents. Descriptive statistics, including mean and standard deviation along with the t-tests were computed for data analysis. Findings of t-test suggest that both male and female students express their gratitude similarly.

**Keywords:** Gratitude, Gender, Undergraduate Students

## Introduction

Gratitude is a profound emotion that enables individuals to acknowledge and value the positive aspects of their lives. It encompasses the acknowledgment of assistance and kindness received from others as well as an appreciation for the experiences that contribute to personal growth. Gratitude can be viewed as both a trait, indicating a consistent tendency to feel thankful and as a state, capturing temporary moments of appreciation in response to specific situations (Jans-Beken et al., 2019). Emmons and McCullough (2003) described gratitude as a deep emotional response marked by wonder, thankfulness and a genuine appreciation for life. Similarly, Sansone and Sansone (2010) viewed gratitude as the act of recognizing and valuing positive experiences or outcomes which fosters a sense of appreciation. A research conducted by Jans-Beken et al. (2019) indicates that gratitude is positively linked to social, emotional and psychological well-being.

Gratitude is a key area of exploration within various philosophical branches including normative ethics, applied ethics,

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political philosophy and moral psychology (Manela, 2019). In a series of four studies McCullough, Emmons and Tsang (2002) explored the factors linked to a grateful disposition. In study 1, they found that self-reports and observer reports of gratitude were related to positive emotions, well-being, prosocial behaviors, traits and spirituality or religiosity. In study 2, they confirmed these results in a broader nonstudent group. In study 3, they mirrored these outcomes and added that gratitude is inversely related to envy and materialism. In study 4, they demonstrated that these links remain significant even when accounting for personality traits like Extraversion, Neuroticism and Agreeableness.

Perez, Peralta and Besa (2021) noted positive correlations between gratitude and life satisfaction, gratitude and spirituality, and spirituality and life satisfaction. Spirituality emerged as key factors that mediate the connection between gratitude and life satisfaction. In other words, gratitude enhances spirituality which subsequently boosts life satisfaction. The study also affirmed the transcendental perspective on gratitude. Individuals who frequently participate in religious services or activities tend to experience a deeper sense of gratitude across various aspects of their lives. Gratitude not only enhances positive emotions but also helps diminish negative ones (Sheldon, Kashdan & Steger, 2011).

Psychology seeks to understand the immediate experience of gratitude (state-gratitude), how often individuals tend to feel it (trait-gratitude), the connection between these two aspects and the potential therapeutic benefits gratitude can offer (McCullough, Tsang & Emmons, 2004; Wood, Maltby, Stewart, Linley & Joseph, 2008). Practicing gratitude can enhance our relationships, improve our mental well-being and help us maintain a positive perspective, even in challenging times (Cregg & Cheavens, 2020). By fostering a habit of gratitude, we can enhance a deeper sense of commitment and connection in our daily lives (Wood, Joseph & Maltby, 2008).

Gratitude as a universal human emotion is expressed and experienced differently across genders; shaped by cultural, societal and psychological factors. Khan and Singh (2013) identified significant gender differences among teachers. Male teachers exhibited higher levels of gratitude while female teachers scored higher on both spirituality and forgiveness. Singh, Khan and Ojastan

(2014) also reported significant gender differences in gratitude among young adults with females exhibiting higher levels than males. In a nationwide survey Kruse, Emmons, Ironson and Hill (2017) found that women are generally more likely than men to experience gratitude including gratitude toward God. The study also revealed that higher levels of overall gratitude were linked to lower HbA1c levels through this connection was consistent for both men and women. Moreover, gratitude directed specifically toward God was related with lower HbA1c levels in women but not in men.

But Kulkarni and Khasgiwale (2022) conducted a study on Indian population and reported no significant difference in gratitude between genders as both demonstrate equal levels of it. In a study Kansar (2018) found a strong positive relationship between gratitude and happiness with gratitude serving as a predictor of happiness among college students. No significant gender differences were found in terms of gratitude and happiness. However, a notable difference in gratitude and happiness levels was observed between first-year and final-year students.

The primary objective of the present study was to examine whether individuals' feeling and expression of gratitude differ according to their gender. It was hypothesized that male and female students will show significant differences in feeling and expressing gratitude.

## Method

### Sample:

The sample for the present study was randomly drawn from different departments of Feroze Gandhi College, Rai-Bareli. All participants were first-year undergraduate students. The sample consisted of 40 students, comprising 20 males and 20 females.

### Measures:

The Gratitude Questionnaire-6 (GQ-6) developed by McCullough, Emmons and Tsang (2002) was employed to measure the tendency to experience gratitude in everyday life. This self-report questionnaire consists of six items. Each item is rated on a 7-point Likert scale ranging from Strongly Disagree (-1) to Strongly Agree (=7) with respondents indicating their level of agreement by selecting

a number 1 to 7 for each statement. The questionnaire typically takes ten to fifteen minutes to complete. Higher scores indicate a stronger disposition to feel and express gratitude in daily life.

#### Procedure:

Each participant in the sample was approached individually in their respective class. After establishing rapport, they were informed that the study was conducted solely for academic purposes and that their responses would remain confidential. Participants were asked to carefully read the instructions on their own and seek clarification, if needed. They were instructed to respond freely by selecting a number on the 7-point scale that best reflected their feelings for each statement. After collecting data, it was scored as per guidelines and then analyzed statistically by using SPSS version 25.

#### Results

In this study gratitude was taken as the dependent variable and students' gender was considered as the independent variable. Descriptive statistics (Mean & SD) and t-tests were computed to verify the significance of differences in the experience of gratitude between male and female students. The obtained results are given below:

**Table-1: Mean and SD of Gender and Gratitude (N=40)**

Variables	Mean	SD
Gender	1.50	.51
Gratitude	26.28	4.06

The minimum and maximum possible scores on the Gratitude Scale are 6 and 42, respectively. The obtained mean score 26.28 with a standard deviation of 4.06 (Table-1) indicates that the participants in this sample exhibit a slightly above-average tendency to feel and experience gratitude in their daily lives.

**Table-2: Mean, SD and t-value of Gratitude as a Function of Gender (N=20)**

Variable	Gender	Mean	SD	SEM	SED	t-value	Remark
Gratitude	Male	25.70	4.17	.91	1.29	-.89	NS
	Female	26.15	3.98	.89			

Table-2 clearly show that female students have the higher gratitude scores ( $M=26.85$ ,  $SD=3.98$ ) than male students ( $M=25.70$ ,  $SD=4.17$ ). But the computed  $t$ -value  $-0.89$  is not statistically significant. This means that there is no significant gender difference, so far experience of gratitude is concerned. Thus, the finding of this study do not support the proposed hypothesis which state that male and female students will show significant differences in feeling and expressing gratitude.

## Discussion

The present study was undertaken to examine whether male and female students differ significantly in their experience of gratitude. The results imply that there is no significant gender difference in the experience of gratitude among the students in this sample. This finding is consistent with Kausar (2018) who found no significant gender differences in the terms of gratitude and happiness among college students. This suggests that in academic settings, gender do not play a significant role in the expression of gratitude. Kulkarni and Khasgiwale (2022) also did not find significant gender differences in gratitude among the Indian population. It is possible that broader factors like personality traits or cultural influences which McCullough, Emmons and Tsang (2002) accounted for, might explain individual variations in gratitude more effectively than gender alone.

In contrast, Khan and Singh (2013) reported that male teachers showed higher levels of gratitude while females scored higher in spirituality and forgiveness. Singh, Khan and Osman (2014) also reported significant gender differences in gratitude among young adults with females displaying higher levels. These findings suggest that in specific populations like teachers, gender differences in gratitude might exist.

In the light of the present study finding, it can be inferred that both male and female students feel equally and express gratitude toward someone or something and are similarly able to appreciate the people, events and situations that have shaped their lives. This capacity for gratitude allows both male and female students to connect with their life experiences in meaningful ways, fostering a greater sense of emotional awareness and thankfulness for their personal history which enhance their resilience and well-being.

## Conclusion

The finding of the present study made clear that both male and female students experience gratitude in a similar manner. Hence, we can say that the ability to appreciate people, events and situations that have shaped one's life is not determined by gender but rather by individual capacity for emotional reflection, socialization and personal values. Since, this study was conducted on a very small sample, so the findings may not fully represent the broader population. Future research with a large and more diverse sample is required to validate the findings of the current study and to provide deeper insights.

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# Salah as a Path to Well-Being for Muslim Students: A Review

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**Abstract:** Contemplative practices have gained considerable attention for their potential in promoting social well-being. Among Muslims, Prayer (Salah) serves as the main source of contemplative practice, and it has been shown to have multiple mental health benefits. Despite being deeply rooted in the daily life of Muslims, the impact of Prayer (Salah) on the well-being of Muslim students in higher education remains underexplored. Highlighting a clear gap in the literature, particularly regarding longitudinal, observational, and experimental evidence of the distinct psychological effects of Prayer (Salah). This review aims to examine the role of Prayer (Salah) in enhancing the well-being of Muslim students by synthesizing insights from recent empirical research using the literature review methodology. The findings indicate that Prayer (Salah), as a structured contemplative practice, plays a significant role in the well-being of Muslim students by enhancing emotional regulation, subjective well-being, optimism, mindfulness, stress management, and resilience. Moreover, Prayer (Salah) functions as both a spiritual practice and as an effective coping mechanism, supporting holistic mental health. This review underscores the practical implications for integrating Prayer (Salah) with evidence-based mental health interventions and recommends future research employing rigorous methodologies, moderator and mediator analysis, and standardized measures to deepen understanding of Prayer's influence on student well-being.

**Keywords:** Contemplative practice, Mental health, Muslim students, Prayer, Psychological well-being, Self

## 1 | INTRODUCTION

Contemplation is a practice that enhances spiritual perception, awareness of the divine and fosters coherence of the soul. It promotes peace, resilience, and mental clarity that is desperately needed in

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these increasingly troubled times (Sabo, 2018). Contemplative practices are not new, rather, they have long been rooted in the history of various traditions around the world. These practices have received considerable attention over the years, both within the religious framework and outside of it, for their potential to promote overall well-being (Varghese et al., 2024).

Contemplative practices are faith-based methods intended to develop concentration, deeper understanding and insight, cultivate awareness and foster compassion (Haynes, 2008). These practices encourage the individual to something larger than their own life, developing and sustaining an experience of being known, seen, safe, soothed, and secure (Segal, 2010). In educational settings, these practices are increasingly used as a means to promote well-being (Zauch, 2021). For university students, the phase of emerging adulthood is a significant period distinguished by identity formation, social expectations, academic pressures, and challenges that may pose a risk to their well-being. Research has shown that contemplative practices significantly improve students' cognitive performance, emotions regulation, and moral development. Besides promoting present-moment awareness, these practices contribute to a deeper self-reflection and understanding (Mart, 2024). Courses that incorporate such practices have also been found to have sustained benefits in the well-being of college students by reducing anxiety and depression and enhancing self-compassion and mindfulness (Lar et al., 2020). Despite the evident positive outcomes, this remains an emerging field that requires further study (Dominguez et al., 2020).

Over the years, various contemplative practices originating from their religious and spiritual traditions have gained popularity. Perhaps the most prevalent is meditation or meditation-based mindfulness. However, the literature seems to be largely dominated by a narrowly defined concept of contemplative practices under the broad term "mindfulness" (Kaly et al., 2023). Evidence suggests that the benefits of secularized contemplative practices may be comparatively lesser than those embedded in a religious or spiritual context (Nishimura & Paquette, 2020; O'Connor et al., 2019). Undoubtedly, practices grounded in religion have been frequently associated with health and human flourishing. Nonetheless, rigorous and controlled studies examining their effects on well-being have been relatively limited (Wade et al., 2024).

### 1.1. Prayer as a form of contemplative practice and well-being

Prayer is central to many religious traditions. A substantial body of literature has shown the benefits of Prayer in mental well-being. People who pray have reported higher levels of well-being compared to those who do not (Frost et al., 2024). It has also been observed that patients who prayed regularly achieved better health, exhibited more favorable health-related behaviors, utilized preventive services, and reported greater satisfaction with their care. (O'Connor et al., 2021). Nonetheless, most of the existing research on Prayer has primarily focused on the Christian tradition (Janssen et al., 2019; Lippman, 2020; Biss & Panta, 2022; Rando et al., 2024; Newman et al., 2024). Considering that Prayer is more essential in Islamic faith than in Christianity and Judaism, it is important to note that Prayer in Islamic tradition and its relationship with mental health and well-being remains underexplored (Albuhari and Khasjok, 2020; Chama-Festus & Chama-Festus, 2021; Santopeter & Abu-Rajya, 2022).

In Islam, health is viewed holistically, covering every aspect of human existence, including the physical, emotional, and mental well-being, to foster inner peace and contentment. According to Munzer & Zaki (2017), Islamic contemplative practices are key to building one's mind and body, as well as enveloping the negative emotions or destructive habits that plague human beings. Prayer in Islam is seen as the main avenue of contemplative practice (Menden, 2013).

The term "Salat" is an Arabic word for Prayer, derived from the root word "Sala", which means to "connect" or "communicate". As the second fundamental pillar of Islam, Prayer is made obligatory by Allah for Muslims to offer five times a day, at specific times: *Raj* (Dawn), *Dhuhr* (noon), *Asr* (afternoon),

Maghrib (sunset) and Isha (evening). It is essential in the life of a Muslim, serving as a source of communication with God and providing a sense of compass in an individual's mind (Wahid, 2022). Allah says in the Quran, "Successful indeed are the believers, those who humble themselves in Prayer" (Al-Mu'minun (The Believers) 23:1-6).

The act of Prayer (Salah) involves both the spiritual and the physical aspects of the body. The process of Prayer (Salah) involves purification of the body from major and minor impurities (wudu or ablution), facing the direction (Qibla), making the intention to pray, wearing sajjadah (Tasbeeh), standing and reciting the first few verses of the Quran (Qiyam), bowing down (Ruku), rising from Ruku, prostration (Sujud), rising from Sujud, sitting for the final sajjadah (Tasbeeh) and concluding with the final sajjadah (Tasbeeh) (Sarkis, 2011). When performed correctly, the series of postures has been found to have several health benefits, such as improved posture, enhanced blood circulation and cardiovascular benefits, neurological benefits, increased muscle strength and flexibility (Alabdulhadi et al., 2013; Ghom-Pasha & Ghom-Pasha, 2021). Regular engagement in Prayer (Salah) can help in bringing positive changes in their function and well-being by increasing the parasympathetic component and decreasing the sympathetic component in the autonomic nervous system. Additionally, it may also promote relaxation and reduce cardiovascular risks (DeJester et al., 2014).

Prayer (Salah) has also been observed to have benefits in mental health and well-being. For instance, Jamal and Darmiah (2012) observed that the frequency of Prayer (Salah) strongly related to life satisfaction. Similarly, Ghazal (2013) & Jay, Khalil, and Ahmed (2011) found that mental health was positively associated with the frequency of Prayer (Salah), indicating that mental health was better for those who prayed regularly compared to those who prayed irregularly. In a literature review, Haddadpour et al. (2021) further highlighted that regular engagement in Prayer (Salah) can help overcome life challenges, thereby leading to better mental health. However, in another review, Sando & Dhaini (2022) reported a direct association between Prayer (Salah) and improvements in mental health indicators such as the desire to live, hope, and happiness, with an inverse association with anxiety, depression, distress, and dissatisfaction with life. Besides these, Prayer (Salah) has also been found to have restorative effects by increasing focus, concentration, and awareness while reducing stress and mental fatigue (Suzuki, 2022).

Numerous studies across diverse domains have demonstrated that Prayer (Salah) exerts positive effects on health and well-being. Mental and spiritual practices such as Prayer (Salah) can significantly influence an individual's physiological and psychological states. The act of Prayer (Salah) embodies humility and submission before God, involving recitation of verses from the Quran and supplications that emphasize seeking protection, mercy, and forgiveness from the Divine. Given these features, it is reasonable to expect that Prayer (Salah) contributes meaningfully to mental and emotional stability.

### 1.2 Role of Prayer (Salah) in enhancing the well-being of Muslim students

There is growing recognition of the mental health benefits of contemplative practices, but the literature remains limited in terms of Prayer (Salah), particularly in the Islamic context. Existing literature has mostly focused on religious or spiritually as a holistic context in the Muslim population rather than addressing specific practices that may contribute to well-being. However, research that has been conducted on Prayer (Salah) tended to be either on the general population, the Christian population, or combined multiple faith groups, resulting in a lack of clarity regarding the distinct psychological effects of Prayer (Salah). This gap is especially significant in the case of Muslim students, who face unique developmental, academic, and social challenges during their university years, and given that Prayer (Salah) is deeply embedded in the daily routines of Muslims, it provides a valuable context to study the potential role of Prayer (Salah) in enhancing the well-being of Muslim students.

Accordingly, this review aims to examine the role of Prayer (Salah) in enhancing the well-being of Muslim students with the help of recent empirical literature. It synthesizes existing evidence on the

effects of Prayer considered here beyond its strictly religious context within Islam, and critically examines what has been measured and evaluated in psychological research with an objective stance free from religious or doctrinal bias, focusing solely on the empirical outcomes reported in prior studies.

Table 1

Table summarizing the studies related to the role of Prayer (Salat) in enhancing the well-being of Muslim students.

Sl. No.	Study	Year	Sample size & source?	Target Population	Age	Methodology	Key factors	Key findings
1	Lee, Khalil, and Ahmed	2017	174 Female	Muslim students	16-20	Exploratory Descriptive research	*Prayer *Mindfulness *Mental health	*Regular Prayer with mindfulness leads to better mental health compared to those who don't offer it regularly with mindfulness *Higher levels of compassion from Salat, which positively influences mental health by promoting spiritual benefits, guidance, and protection from negative behaviors *Clear benefits of Salat can be realized when paired with mindfulness (Vitality)
2	Zamudin, Nishaudin, Ascher, Yusoff, & Othman	2018	40 Indonesians	Muslim students	18-21	Mixed method survey & interview & thematic coding	*Prayer	*Frequent and consistent practice of Prayer was associated with higher subjective well-being *Frequency of Prayer was significantly mediated higher levels of mindfulness, spirituality, optimism and social support with spirituality and optimism acting as mediators between Prayer and subjective well-being
3	Al-Ghamdi, M., & Al-Sayegh, D.	2020	155 Students	Muslim	18-24	Validation analysis	*Prayer *Mindfulness *Spirituality *Social support *Optimism *Subjective well-being	*Frequent and consistent practice of Prayer was associated with higher subjective well-being *Frequency of Prayer was significantly mediated higher levels of mindfulness, spirituality, optimism and social support with spirituality and optimism acting as mediators between Prayer and subjective well-being

4	Salim et al.	2027	200 Muslims	Muslim students	14-04	Regression analysis	<ul style="list-style-type: none"> <li>•Self-actualized</li> <li>•Participation in religious activities</li> <li>•Frequency of Prayer and belief activities</li> <li>•Predict mental health among university students</li> <li>•Female students were found to be higher in Prayer offerings, religious offerings, and belief activities than men.</li> </ul>
5	Muhammad, M., Muhsin, I. & Zahedi	2026	10 Muslims	Muslim students	-	Descriptive quantitative analysis	<ul style="list-style-type: none"> <li>•Prayer</li> <li>•Religious engagement in Prayer significantly influences the mental health of students by reducing anxiety and increasing optimism and self-efficacy.</li> <li>•Prayer correlates positively with positive feelings and emotions through the "act of effect" serving as a form of therapy.</li> </ul>
6	Rezaei	2028	104 Christians	Christian and Muslim students	18-02	Survey method	<ul style="list-style-type: none"> <li>•Spiritual practices (Prayer and meditation)</li> <li>•Stress management</li> <li>•Resilience</li> <li>•Sense of belonging</li> <li>•Life</li> </ul> <ul style="list-style-type: none"> <li>•Spiritual practices such as Prayer and meditation significantly influence mental well-being.</li> <li>•Sense experienced greater emotional benefits and meaning.</li> </ul>

7	Suhail et al.	2020	300 Muslim students	12:00	Regression analysis	"Prayer (Salah) is regulative "	"Regular engagement in Prayer can lead to enhanced emotion regulation and reduced stress, which in turn improves the mental well-being of university students."
8	Sana et al.	2020	50 Muslim students	12:00	Used mindful awareness and intention	"Prayer (Salah) is an act of worship in front of Allah (God) "	"Faith based coping mechanisms such as Prayer, recitation of the Quran, and reflexion on God can significantly enhance mental health." "Regular practice can enhance stress management and help in overcoming emotional misadjustment."

## 2 | CONCLUSION

The reviewed literature consistently emphasizes the positive effects of Prayer (Salah) on various aspects of well-being and mental health among Muslim students. Studies show that regular and mindful engagement in Prayer (Salah) helps increase emotional regulation, subjective well-being, optimism, spirituality, and mindfulness, while reducing stress, anxiety, and negative emotions (through fostering social well-being). Besides its spiritual significance, Prayer (Salah) also seems to function as an effective coping mechanism by promoting composure or contentment while reducing anxiety, negative feelings and emotional misadjustment.

The Prayer, especially when performed with mindfulness (Khushu), further enhances its therapeutic benefits. However, it is also essential to note that these benefits can only be achieved through consistent and frequent practice, and this may vary among different individuals. Gender differences have also been observed, with females generally experiencing greater psychological benefits from Prayer (Salah) than males. A consistency was observed throughout the findings of the studies regarding the benefits of Prayer (Salah) on the well-being of Muslim students, which may potentially be due to the universality of Prayer (Salah) as a core religious practice. Therefore, to summarize, it is evident that Prayer plays a substantial role in enhancing the well-being of Muslim students.

Despite the promising findings, the current body of literature remains limited, highlighting the need for more thorough studies to understand and strengthen the potential of Prayer (Salah) in supporting students in their pursuit of well-being. Additionally, it emphasizes the importance and need for understanding and integrating contemplative practices such as Prayer (Salah) into mental health frameworks to better support students in today's modern world.

## 2 | THEORETICAL CONTRIBUTIONS

This review adds to the existing body of literature on contemplative practices and well-being by placing Prayer (Salah) within the framework of contemplative science and positive psychology. While Prayer (Salah) has been studied previously, this review specifically emphasizes its benefits for Muslim

students. The findings highlight the role of Prayer as a faith-based contemplative practice that promotes emotional regulation, subjective well-being, calmness, and overall mental health and well-being among Muslim students. These insights enhance the understanding of how faith-based contemplative practices such as Prayer (Salat) influence well-being.

#### 4 | PRACTICAL IMPLICATIONS

This review highlights several practical implications. To begin with, understanding the connection between Prayer (Salat) and well-being is necessary for the development of future interventions and preventive strategies that are inclusive and address the specific needs of Muslim students at universities. In addition to this, mental health professionals and counselors should integrate Prayer (Salat) with evidence-based mental health approaches such as Cognitive Behavioral Therapy (CBT) or Mindfulness-Based Stress Reduction (MBSR) to offer a personalized and culturally sensitive support for Muslim students. This integration can enhance the effectiveness of the intervention by leveraging spiritual and psychological resources for holistic well-being. Finally, mental health professionals and educators need to acknowledge the therapeutic value of spiritual and religious practices such as Prayer (Salat) and its role in the well-being of students. However, such practices are not one-size-fits-all and may differ between individuals. Therefore, various strategies should be offered, enabling flexibility and personalization. These implications can help create a more supportive and psychologically nurturing environment for students whose faith plays a central role in their lives, while helping them to pursue well-being in today's modern world.

#### 5 | LIMITATIONS AND AVENUES FOR FUTURE RESEARCH

There are a few limitations in this review. Firstly, it only summarizes the observed results of previous studies; no conceptual or experimental study or data analysis were performed. Secondly, no comparative studies were carried out. Finally, due to the paucity of research in this area, this review includes only a few studies.

The following are the recommendations based on the review that address gaps in the current body of literature for future research.

**Quantitative and qualitative studies:** A limited body of literature calls for more quantitative and qualitative studies, which can provide measurable evidence on the strength and direction of the relationship between Prayer (Salat) and the well-being of Muslim students, as well as capture their subjective experiences.

**Longitudinal and experimental studies:** Longitudinal and experimental research are required to examine the relationship over time and to establish causality between variables.

**Need for larger and more diverse samples:** Studies included in the review were often of a small and uneven sample, which limit the ability to generalize, highlighting the need for larger, balanced, and diverse samples.

**Need for Greater Examination of Psychological Outcomes:** Several studies have demonstrated that Prayer (Salat) can enhance well-being by promoting personal spiritual benefits among students. However, the literature remains limited in its exploration of diverse psychological outcomes. Future studies should investigate the effects on a wider range of well-being indicators, such as emotion regulation, coping strategies, resilience, and psychological well-being, using standardized and validated measures, enabling a more comprehensive understanding and making meaningful comparisons.

importance of Prayer distinction, very few studies have assessed the type, frequency, or quality of Prayer. Future research should address these distinctions, as they are necessary for a nuanced exploration to gain more insight into Prayer (Salah) and its impact.

Integration of Prayer (Salah) with other contemplative practices: Examining the combined effects of Prayer and other contemplative practices on well-being can provide a more comprehensive understanding and may serve as a foundation for future experimental studies to determine whether these can work synergistically to enhance students' well-being.

Integration of Prayer (Salah) with mental health interventions: Prayer (Salah) can act as a tool to improve Muslim students' well-being, but it should not replace effective psychological interventions. Future studies are needed to explore interventions that combine Prayer (Salah) with established mental health approaches to examine their potential and effectiveness in enhancing well-being.

Mediation and moderation analysis: Future studies could benefit from using mediation and moderation analysis to understand the relationships between Prayer (Salah) and well-being. Mediation models can explore the factors that might act as pathways through which Prayer influences well-being, while moderation analysis can examine whether the relationship varies across the frequency of engagement in such practices or gender.

Need for Objective measures and tools: There is a need to develop more standardized and objective measures to study Prayer (Salah), enabling a more reliable assessment and understanding of Prayer and its impact on well-being.

Cross-cultural studies: Given the cultural diversity, including Muslim-majority and Muslim-minority countries, there is a need for more research to assess the outcomes with specific cultural contexts to gain further insight.

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## Religiosity as a Correlate of Anxiety among Housewives

Dr. Vinay Kumar Singh<sup>1\*</sup>

### ABSTRACT

The present study was an endeavor to explore the association between anxiety and religiosity among housewives. The sample comprised 18 housewives aged between 21 to 38 years belonging from urban and rural areas of Barabanki district in India. Two scales (1) Faith Involvement Scale by Baskin (1971) and (2) Religiosity Scale by Bhatnagar (2005) were used to measure the anxiety and religiosity level of the housewives, respectively. Descriptive statistics (Mean & SD), Pearson's product moment correlation coefficient and t-test were employed to analyze the data. Findings of the study reveal that (1) religiosity positively will act, and (2) it shows a significant association with anxiety levels among housewives.

**Keywords:** Anxiety, Religiosity, Age, Housewives

**A**nxiety is a prevalent psychological condition that affects individuals across various demographics, including housewives who often juggle multiple responsibilities within the household. Factors such as social expectations, financial stress and family demands contribute to their emotional well-being. Anxiety is a state of uneasiness and worry, often generalized and often well arising as an exaggerated response to a perceived threat (Bevan & Hale, 2007).

Anxiety disorders are a group of mental health conditions marked by intense anxiety and fear. It includes generalized anxiety disorder, specific phobias, social anxiety disorder, obsessive compulsive disorder, agoraphobia, panic disorder and acute stress disorder. Each type is triggered by different factors and individuals may experience multiple anxiety disorders simultaneously (APA, 2013).

Religion is a powerful motivation that significantly influences social behavior and provides psychological and therapeutic benefits (Bhatnagar, 1999). The Oxford English Dictionary defines religiosity as the quality of being religious, encompassing religious beliefs and feelings. It can also refer to an display or conspicuous expression of religious devotion (Wikipedia, 2021). Bhatnagar (2005) describes religiosity as having four aspects: doctrinal, practical and emotional. The doctrinal aspect involves faith in God. It includes communication, fellowship and identification with the group. The practical aspect focuses on following ethical values and religious rituals. The emotional aspect refers to devotion, dedication and the joy experienced in religious practices.

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Religiosity cannot exert its health benefits by easing stress and anxiety through prayer, meditation and consistently reported as well as reducing loneliness and distress. *Martens-Almeida, Neto and Koenig (2005)* reviewed 300 studies and noted that higher religious involvement reduces psychological well-being, lowers depression and reduces substance abuse, particularly in stressful situations. *Fennell et al. (2009)* also reviewed 7,235 documents and selected 11 studies with 3,329 participants in their meta-analysis and reported that higher religious orientation was associated with reduced anxiety and depression.

*Moore, Bane, Fakhry and Neph (2012)* observed that religious service attendance is linked to better mental well-being across both majority and minority religions in UK. However, belonging to a minority ethnic religious group is negatively associated with mental well-being. Thus, religious services or outside alternatives could help enhance overall mental health. *Harris, Schwab-Stone and Conway (2007)* conducted a principal component analysis on college students and found that religious involvement, prayer and social involvement in a religious community were strongly associated with lower trait anxiety. These findings indicate that maintaining a dedicated and engaged religious practice may contribute to reduced general anxiety levels. In contrast, *Fitzmaurice, Lohfeld and Ismail (2014)* reviewed the outcomes of one thousand religious services, most frequently showed higher levels of anxiety in end-of-life-care.

*Khanik, Haddad, Hal and Hays (2015)* analyzed ten studies to explore the relationship between various domains of religiosity and different types of anxiety disorders in adults and identified four key findings. Certain aspects of religiosity and specific religious interventions had a protective effect on generalised anxiety disorder in 40% of the studies. In contrast, 50% found no link between religiosity and post-traumatic stress disorder while results for panic and phobic disorders were mixed. *Harris, Neph and Edmonds (2006)* reviewed 17 studies related to the link between religiosity and anxiety. The findings reveal results to vary (show) a different, none or reverse and often no effect of religiosity on anxiety.

*Abdel-Khader, Nassif, Ghorasheh and Leste (2015)* conducted a meta-analysis of 10 Arabic studies on religiosity and anxiety among Arab-Muslim participants. The study found no significant impact of age and gender but indicated that religiosity helps reduce anxiety through support and coping mechanisms. *Shirk and Teitelman (2006)* noted that women aged 31–39 experienced lower positive affect than those aged 33–34 while those aged 25–29 reported higher negative affect. These differences are partly linked to younger women's concerns about aging and their negative thoughts about youthful identity. *Frank, Nuneff, Lank and Miller (2014)* observed that religiosity increases with age and is linked to lower depression symptoms. Age is inversely related to the relationship between religiosity and depression. The higher religiosity associated with reduced depression in both middle-aged and younger adults.

*Duggan and McCreath (2000)* explored the links between religiosity, life satisfaction, age and gender. They found that religious affiliation had a stronger impact on life satisfaction than private devotion. Religiosity increased with age and women reported higher levels than men. *Cox and Fairweather (1999)* also noted that belief in God is stronger across all ages but increases with age. Older individuals are more likely to view religion as an important and believe it more fervently. Church attendance is also linked to greater life satisfaction and better adjustment.

## Religiosity as a Correlate of Anxiety among Indians

### Hypotheses

- The present research was formulated for the following objectives:
- To examine the relationship between age, religiosity and anxiety among Indians.
- To analyze the differences in anxiety and religiosity levels among Indians with varying age.

### Hypotheses

The hypotheses for the present study were as follows:

- There will be significant correlation between age and religiosity among Indians.
- There will be significant correlation between age and anxiety among Indians.
- There will be significant correlation between anxiety and religiosity among Indians.
- There will be significant difference in religiosity among Indians based on varying age.
- There will be significant difference in anxiety among Indians based on varying age.

## METHODOLOGY

### Sample:

The sample for the present study consisted of 50 Indians. They were selected randomly from urban and rural areas of the Bangalore District in India. The age of the selected participants ranged between 22 to 60 years.

### Measures:

Following two scales were used to measure the level of anxiety and religiosity of the participants.

1. **Anxiety Inventory Scale:** To assess the anxiety level of the Indian urban Bangalore District was used. This scale was constructed and standardized by Verma in 1991. The scale is composed of 100 items and all items have to be answered as either positive or negative, i.e. "Yes" or "No". The test had high reliability both the split-half and test-retest methods with the calculated reliability coefficients .94 and .71, respectively. The higher scores reflect a greater level of anxiety.
2. **Religiosity Scale (R.S.):** To assess the level of religiosity of the Indian urban Bangalore District was used. This scale was constructed and standardized by Bhattacharya in 2005. It is a five-point Likert type scale with the alternative responses, i.e., 1 totally agree, Agree, Can't Say, Disagree and Totally Disagree. The scale is composed of 20 items and again each item has five alternative responses i.e. as the 1 indicates the response "Totally Agree" and similarly 5 represents "Totally Disagree". The scale possesses high reliability. The reliability coefficient of the scale by split-half and test-retest method was found .80 and .78, respectively. The higher scores indicate greater degree of religiosity.

### Procedure:

The scale were administered individually to the randomly selected participants in a convenient location. Before administering the test, a good rapport was established and participants were informed that the study is purely academic, with assurance of confidentiality regarding their responses. They were requested to carefully read the guidelines on the cover page of each scale before responding and to give a score. Additionally, they were asked to keep one of the copies of details on the first page of each scale. They were also instructed to

### Religiosity as a Correlate of Anxiety among Indians

score from responses given to the designed items for each item. After completing the self-test, responses were structured to answer the questions were left unanswered. Scoring was conducted in accordance with the procedure outlined in the test manual.

### RESULTS

The data were processed and analyzed using SPSS version 23. Descriptive statistics (Mean & SD), Pearson's product moment correlation coefficient and  $t$ -test were carried out. The results are as follows:

Table 1. Mean, SD & Intercorrelation Coefficients ( $r = 0.0$ )

Sl. No.	Variable	Mean	SD	1	2	3
1.	Age	3.44	06	-		
2.	Religiosity	122.52	14.17	0.71*	-	
3.	Anxiety	54.74	13.91	0.17	0.33**	-

\*  $P < 0.05$  \*\*  $P < 0.01$

Table 1 presents the mean, standard deviation and intercorrelation coefficients for the variables age, religiosity and anxiety among a sample of 38 participants. Age shows a significant positive correlation with religiosity ( $r = 0.22$ ,  $P < 0.05$ ). It indicates that as individuals grow older their level of religiosity tends to increase. But it has no significant correlation with anxiety. Thus, the hypothesis no 1 is accepted while hypothesis no 2 is rejected. It was initially proposed that age will be significantly correlated with religiosity and anxiety among Indians.

Religiosity has a strong negative correlation with anxiety ( $r = -0.47$ ,  $P < 0.01$ ). It suggests that individuals with higher religiosity tend to experience lower anxiety. Hence, the finding of this study supports the proposed hypothesis no 3 which says that there will be significant correlation between anxiety and religiosity among Indians. Thus, results of the present study highlight the positive psychological benefits of religious beliefs and practices in managing stress and anxiety.

Table 2. Age differences in Religiosity and Anxiety among Indians

Sl. No.	Variable	Age	N	Mean	SD	SEM	SED	t-value
1.	Religiosity	25& below	26	118.6	13.84	2.74	2.86	2.31*
		Above 25	22	127.59	13.43	3.03		
2.	Anxiety	25& below	26	54.56	13.98	3.13	3.06	1.88
		Above 25	22	57.86	13.17	4.99		

\*  $P < 0.05$

Table 2 shows the age differences in religiosity and anxiety among Indians. The results indicate a significant difference in religiosity based on age. Those above age of 25 years show significantly higher religiosity ( $M = 127.59$ ) compared to those aged 25 and below ( $M = 118.6$ ). The  $t$ -value 2.31 is statistically significant at 0.05 levels. It may be that older Indians are said to be more religious than their younger counterparts. Hence, the finding of this study supports the 2nd hypothesis no 4 which says that there will be significant difference in religiosity among Indians based on varying age.

but no significant age difference is observed in anxiety levels. The Indonesian aged 31 and above have a slightly higher mean anxiety score ( $M = 61.36$ ) compared to those above 20 years ( $M = 55.56$ ). But the  $t$ -value, 1.08 is not statistically significant. This suggests that anxiety level does not differ considerably between younger and older Indonesians. Hence, the findings of this study do not support the proposed hypothesis as 5 which states that there will be significant differences in anxiety among Indonesians based on varying age. Thus, it can be concluded that the religiosity tends to increase with age among Indonesians while anxiety levels remain relatively similar across age groups.

## CONCLUSION

This study investigates whether religiosity serves as a protective factor or a potential source of stress among Indonesians. The study observed a strong negative correlation between religiosity and anxiety. It indicates that Indonesian with higher religiosity tend to experience lower anxiety levels. The finding is consistent with Maslow-Abrams, Han and Kang (2006) and Perreman et al. (2014) who reported that religious involvement contributes to psychological well-being by reducing stress, anxiety and depression. Additionally, Hays, Schumann and Caron (2002) stated that religious commitment and social involvement in religious communities were linked to lower anxiety levels. Thus, it is concluded by us that religiosity provides coping mechanisms associated.

The present study also found a significant positive correlation between age and religiosity. It indicates that older Indonesians tend to be more religious than their younger counterparts. This supports the findings of Cox and Hammonds (1998), and Bergin and McCosker (2001) who reported that religious tends to increase with age. Similarly, Haines, Madril, Lark and Mober (2014) observed that older individuals exhibit higher religiosity and often found in better mental well-being.

On the other hand, the lack of significant correlation between age and anxiety suggests that anxiety levels remain relatively stable across different age groups. Their contents will finding of Hanan and Teichert (2016) who stated that younger women reported higher negative affect due to concerns about aging while older women experienced greater emotional stability. Nonetheless, the finding of the present study aligns with Khalil, Hachem, and Ali Huss (2017) who reported mixed findings on the relationship between religiosity and various anxiety disorders. Thus, we can say that the correlation between age and anxiety may not always be straightforward.

The significant difference in religiosity between younger and older Indonesians ( $r = -0.23$ ,  $P < 0.01$ ) further supports the trend observed in prior studies that religiosity increases with age (Hogan & McCosker, 2001; Cox & Hammonds, 1998). But the nonsignificant difference in anxiety levels across age groups indicates that older Indonesians consistent with age do not necessarily experience any substantial of changes in anxiety levels.

## CONCLUSION

Overall, the present study supports the notion that religiosity plays a significant role in reducing anxiety among Indonesians, especially as they age. However, the stable anxiety levels across age groups indicate that we should consider additional psychological, social and environmental factors. Future research with larger and more diverse samples could provide deeper insights into the causal relationship between religiosity, anxiety and age. This will provide a broader perspective on mental health and coping strategies in diverse settings.

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**Conflict of Interest**

The author declares no conflict of interest.

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# Scytonemin Production by Cyanobacteria: A Threat To Algal Stromatolites in Salkhan Fossil Park, India

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## Abstract

The present study examines protection of important stromatolites on islands in the Salkhan Fossil Park, Salkhan, India. Unfortunately, the fossils are at risk of overexposure by rock-monsoons dominated by scytonemin. Some cyanobacteria have yellow-brown, lipophilic extracellular polysaccharide sheath pigment scytonemin that absorbs UV radiation and helps them to survive. Scytonemin, an evolutionary significant pigment, was extracted and purified from the surface of the stromatolitic fossils. Genus including *Scytonema* sp., *Lyngbya* sp., and *Aphanocapsa* sp. were the most prevalent in these monsoons. Scytonemin was identified and characterized using Fourier transform infrared (FTIR) spectroscopy, elastic spray ionization-mass spectrometry (ESI-MS/MS), high-performance liquid chromatography (HPLC), and UV-Vis spectroscopy. <sup>70</sup>Se absorption peak at 202 nm and a retention time of 1.42 min, scytonemin was found to be significantly present in the sample. Additionally, absorption was also observed at 202, 275, and 300 nm. In the FTIR spectrum, absorption was observed at 3421, 2948, 1827, and 1699 (1328 cm<sup>-1</sup>). This compound's identity as scytonemin was further confirmed by the ESI-MS/MS spectrum, displaying significant peaks at m/z 406, 217, 229, and 248. Scytonemin is a way to identify the presence of cyanobacterial colonization and its production enable them to cope with the harsh environmental conditions it exists in the rock monsoons. This biological issue is significant since it is related to the significant aspect of an important geological site, which is also a social and political issue. The bioprotection of the fossils of the park may be significantly influenced by the biological traits that are rich in scytonemin.

**Keywords** Microorganisms · Cyanobacteria · Geological site · Stromatolite structure · Pigment · Salkhan Fossil park · Scytonemin · Substrate biofilms (SABs)

## Introduction

When photosynthetic cells are exposed to the Sun, they must withstand the deadly ultraviolet radiation (UVR) that reaches the Earth's surface. Therefore, in addition to using other defense mechanisms like limited charge, antioxidant production, other biochemical mechanisms, and genetic repair, some cyanobacterial genera (but not

all) have evolved to produce the photoprotective pigment scytonemin (Pothal et al. 2020; Sun and Mallik 2022). Numerous cyanobacteria that live in a variety of environmental settings have been shown to induce this Sun-blocking photoprotectant (Pothal et al. 2020; Cannon et al. 2011). These habitats include saturated soils, freshwater pond springs, supralittoral rocks, intertidal subtidal rocks, thermal springs, and decomposing plant matter among other settings (Pothal et al. 2017; Saha et al. 2011). The extracellular polysaccharide sheath's scytonemin can effectively block up to 90% of UVR from entering the cyanobacterial cell, reducing photobleaching of dihydroxyflavonol (DHF) and maintaining photosynthetic efficiency (Sun and Mallik 2022). Thus, scytonemin production maintains the cell's normal functionality and photostability while aiding in photoprotection (Pothal et al. 2020). Cyanobacteria may produce this pigment through a complex three-step process, in which multiple

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stress factors are involved. Therefore, cyanobacteria that live in conditions with high temperatures, frequent cycles of desiccation, intense light, and nutritional constraints have greater concentrations of acetylenic (Gangaj et al. 2013; Natarajan and Mahalingam 2017). One example of a pigment molecule found in fossil records that have scientists calculating them and a network of genes and factors concerning the rock surface is carotenoid rock (Zajad et al. 2022). The underlying rock around present the carotenoids from heat buffering, finally UV radiation, freeze-thaw events, and improve moisture availability and physical stability. Algal/cyanobacterial colonization causes geological rocks, soil microclimate, and stores all over the world to exhibit concerning signs of desiccation, including the loss of sculptural structure and the development of pits, cracks, and fissures (Droop-Calvo et al. 1991). As proof of the importance of life on the Earth, the Indian Fossil Park, situated in the North-Eastern region of Eastern Near Deodah of India, is one of the key geological sites for examining the biological and geological evolution of this planet. The microclimate found in this fossil park is the oldest in the world, which makes it extremely important to the scientific community (Singh 2012). The park is older and larger than Yellowstone National Fossil Park in the United States of America, including fossils from the Mesoproterozoic epoch dating back 1000 million years. The 12-km-long Talamone nature refuge has microclimate, which are found on various that suitable slope. Limestone chloride-sulfate rocks made up these microclimate, which were created millions of years ago by trapping, precipitating, and binding microorganisms in the rocks, primarily cyanobacteria (Singh 2012). However, because of the indifferent attitude of the local administrative, scientific community, and untransformed residents, this fossil park is currently neglected. The fossilization of these primitive fossils by the cyanobacteria-dominated rock microclimate that have developed on the surface of these weathered pores as additional ecological risk. Biological stressors contain a variety of microorganisms such as cyanobacteria, fungi, bacteria, and algae. Because bacteria have a wide variety of self-defensive mechanisms linked to enhanced colonization and mineral weathering, their growth and adhesion on fossil rock's surfaces provide a significant challenge to the preservation of these primitive fossils (Tharman et al. 2018). In addition to extreme sunlight, UV light, and extreme dryness, fossil rocks surface maintain temperatures of 60 °C. This colonization is a survival strategy (Zajad et al. 2022). As they grow on the surface under specific circumstances, these microorganisms, which include cyanobacteria, algae, and fungi, decay rocks in four different ways. (1) Organic

acids, such as carbonic acid and humic acids, which are produced by microbial metabolism and direct microorganisms cells interact with silicates and encourage chemical weathering. (2) The release of chelating chemicals causes the loss of metal cations by chelating various metal cations, such as calcium, from the rock substrate in order to support microbial growth and activity. (3) The rock's structure is loosened as phylogenies and other organisms are extracted from the rock substrate. (4) A current micro-weathering hypothesis states that the microbial (1), iron-oxidation mechanism (COM) releases some adverse substances, leading to the breakdown of sulfate minerals (Chen et al. 2011). Rock weathering as a result of these four mechanisms as well as the adhesion and penetration of extracellular polymeric and fungal hyphae.

Cyanobacteria on weathered rocks can be identified (including the deeper layers of rocks), biophilic (growing under small stones and pebbles), or epiphytic (growing on the substrate surface), depending on where they colonize (Jensen and Armitage 2010). According to Vila et al. (2022), the extent of the interface is a vast and ancient ecological niche that can be found at many different sizes, including microscopic and planetary levels. Substratal biofilms (SbFs) are self-organized structures with a thick matrix of closely related microorganisms attached to a substrate that are found at the mineral-air interface (Vila et al. 2022). SbFs communities can also be found in outdoor water environments, fossil biofilms (in the carbon cycle), and stone-aged rocks (Vila and Coglietti 2019). Since their cyanobacteria-dominated rock microclimate acts as an illustration of the interaction interface, the current work is equally significant from the perspective of pigment-based microbial ecology. Cyanobacteria are the only species that can survive in such extreme conditions and flourish on the blackish-brownish crust of these rocks. Their dark color contributes and promotes pigment synthesis and, therefore, adaptation that allowed them to colonized rock environments (Pollock et al. 2017). In extreme conditions, a strong shield in the cyanobacterial cells' cell wall-like matrix that prevents other cell-like microclimate by absorbing incoming UVB (García-Frías and Cazorán 1991; Garcia Frías et al. 1992; Pridmore et al. 1995). Therefore, cyanobacteria allows cross-sectional cells to survive for a long time under extreme stress by using the best content of soluble energy. The microclimate potential of acetylenic was previously demonstrated (García Frías and Cazorán 1991). Acetylenic production is also impacted by oxidative stress, high temperatures, desiccation, and ultraviolet radiation in addition to UVB (Fleming and Cazorán 2007, 2009). Cyanobacteria were widespread acetylenic as one of their

key photosynthetic mechanisms against locally change of incoming UVB when there was no ozone layer in the Earth's atmosphere (García-Pedrol et al. 1992; Raboin et al. 2011). Substrate biosynthesis was essential for the evolution of oxygenic photosynthesis and the emergence of aerobic life on Earth. It also enabled the succession of cyanobacteria and helped by assembling life without the ozone layer (García-Pedrol et al. 2019). The pigment, carotenoids, which is produced by the SGR5 gene on the ancient water bacteria the basis of an current investigation. To investigate the role of carotenoids in the survival of cyanobacteria by a ground experiment such as food racks and its role in the bioremediation of these pollution loads, we tried to make the cyanobacteria-dominated biological system that grow on the food facilities and cultural processes of a ecosystem is actually growing biomass using modified biophysical techniques. Research team concentrates on creating new technologies that allow for early detection of contamination because it is rarely amenable for rock surfaces to get relevant. Detection of cyanobacterial pigment accumulation from the rocks and water surfaces may provide an early and accurate indication of cyanobacterial colonization. This will allow for the treatment of endemic problems in its native places, prior to the production of biofilms. These food racks are also seriously threatened by a variety of factors, including anthropogenic activity, atmospheric fluctuations, atmospheric agents, and condensation as capillary dispersion and small immediate activities.

## Materials and Methods

### Collection Sites and Sample Collection

The Ashoka Food Park is situated in the village of Dahanu in the South India district of Uttar Pradesh, India, 12 km from Raebareilly town on the Varanasi-Shahdol Major road. It is situated between 24°50' North and 87°02' East. Samples of biological events were taken from the "food facilities" surfaces in the food park (Fig. 1). Crusts were removed from the surfaces using a sterilized plastic scraper. We visited the food park for the first time in April 2012 for academic purpose, however, final experimental sampling was done in April 2022. The environmental conditions such as temperature, light intensity and moisture are optimum in the month of April. We noticed that the "food facilities" surfaces had developed thick black bio-crusts (Supplementary Fig. 1). On the surfaces of the biofilms, fresh crusts are growing. Samples were aseptically placed in a sterile plastic bags and brought to the lab for analysis. Digital images and the location of the sampling sites might be recorded with a GPS and a digital camera. Relative humidity, temperature, and UVA and UV-B radiation were measured at each position using a digital solar power meter (Chlor, model number, Jansco-2016-spec), digital thermometer, and hygrometer (Dahanu et al. 2017a). At least three replicates of the experiments were conducted three times, and the mean values/SD were computed from the three replicates (n = 3).

**Fig. 1** Distribution of India with Dahanu in state of the study location. The Ashoka Food park, showing the location of the park situated in the South India district of UP.



## Identification of Organisms

After being submerged in sterile distilled water for two hours, the collected strains were routinely cleaned. Under a compound microscope, a few samples of the collected strain was inspected to look for characteristics, primarily cytomorphology. The organisms visible in the strains were further confirmed using *DNAstar software*, a *DNAstar-2011 scientific digital camera*, and an *ImageJ scientific microscope*. Standard cytomorphology and taxonomic keys were used to identify cytomorphology closely based on their morphology (*Microbiology* 1978; *Kumar et al.* 2014).

## Pigment Analysis

The same quantity of yeast (5 mg) was obtained, suspended in 20% methanol (v/v), and the absorption spectra were measured in a *Shimadzu UV-1601U* double-beam spectrophotometer with quartz cuvettes in the wavelength range of 200–800 nm in order to analyze the pigment profile of the yeast (*Kumar et al.* 2020).

## Extraction of Saponins

Extraction of saponins was done by overnight incubating the inoculated (38 °C) yeast suspension (dry weight = 1 g) with 10 mL methanol (90% v/v) at 4 °C and this was followed by centrifugation (2011–Sigma, cycle 2000, Force 600) at the whole rotation for 4 min. The resulting extract was centrifuged at 11,200 g for 5 min, and the supernatant was evaporated by a rotary at 38 °C and reconstituted in 500  $\mu$ L of methanol/water (1:1 v/v). Samples were filtered through microcentrifuge syringe-driver filter (0.22- $\mu$ m pore-size) (Acme System Biotech, New Delhi) before undergoing the LC/MS and HPLC analyses (*Rajay et al.* 2017).

## High Performance Liquid Chromatography (HPLC) Analysis

A reverse-phase HPLC system (Waters 2000 with photo-diode array (PDA) detector, auto-injector T17 plus, HPLC/MS, Milford, USA) modified with Empower-3 software was used to purify saponin. An ODS-1 (RP 1E) column (Fluor, Spherosorb analytical column, 3  $\mu$ m, 4.6 × 250 mm diameter, Inertsil) and a guard (4 × 10 mm inside diameter) was installed in the HPLC system. To inject samples (10  $\mu$ L) into the HPLC column, an auto-injector (Fluor T17 plus autoinjector) was utilized. Using the mobile phase (vol. conc. A: ultrapure water; solvent B: acetonitrile-methanol, acetonitrile:water, 71:24:05, v/v), elution was kept at a flow

rate of 1.0 mL/min<sup>20</sup>. A gradient elution program of 20 min was set which increases linearly with 0–1 min from 10% solvent A to 100% solvent B and 1–30 min at 100% solvent B. The PDA scan wavelength was altered between 250 and 750 nm, and the absorption wavelength was set at 250 nm (*Kumar et al.* 2021). The solvent that corresponded to the visible transition time (RT) allowed for the identification of saponins by its characteristic absorption maximum (298 nm), and the concentration of saponins was calculated using an extinction coefficient of 1124 Lg<sup>-1</sup>cm<sup>-1</sup> at 298 nm (*Guinn-Petel et al.* 2005; *Parley et al.* 2020), while that we collected the portion that contained only saponins, used a flow-up to evaporate it, and then dried it in a vacuum manifold for another 30 min to give a pure saponin. FTIR and ESI-MS were employed to further characterize the pure saponins.

## Fourier transform infrared (FTIR) spectroscopy

Through HPLC, pure saponins containing fraction was obtained. The saponin was evaporated and dried into a powder. It was dried for 3 days in a vacuum desiccator multiple times. Then, to further characterize purified saponins, FTIR spectroscopy was employed. Using an FTIR-IR spectrophotometer (Jasco 670 (Fujin Eimo, Walkers, UK, UK), UK) and a KBr beam splitter, IR transmission values were measured from 4000–620 cm<sup>-1</sup>. Over dried KBr and saponins were mixed in 1:100 ratio. The samples mentioned as a wavelength KBr disc. 24 scans were used to record the spectra at a resolution of 4 cm<sup>-1</sup> (*Parley et al.* 2020; *Kumar et al.* 2021).

## Electrospray ionization mass spectrometry (ESI-MS/MS)

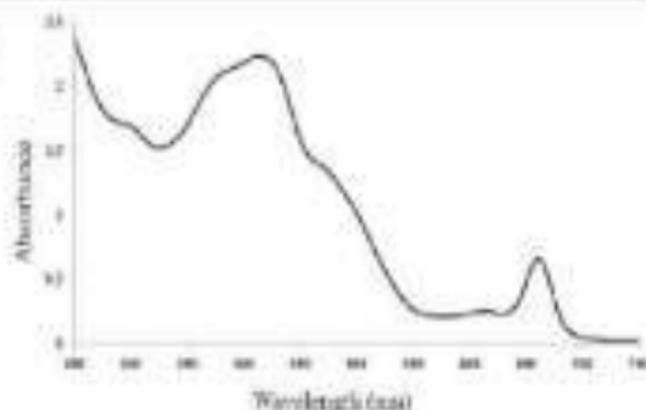
HPLC-purified saponins were collected for the production of protonated molecules by ESI. An Agilent 1100 mass spectrometer (Baker Instruments Inc., Bremen, Germany) was utilized for recording mass spectrum. The MS analysis was performed in positive MS mode with a scan range from m/z 100 to 600. Saponins ions were specifically identified by MS/MS based on previously determined *m/z* and *m/e* values. Other MS settings were: capillary voltage (3.0 kV) and temperature (300 °C). The data were analyzed using the software *Data Analysis 4.0* (Baker Instruments Inc., Bremen, Germany) (*Parley et al.* 2020).

## Statistical Analysis

All the data obtained from the experiments were analyzed using *Minitab Excel* (Minitab, Washington, USA).



**Fig 3** Absorption spectrum of *Silybum maritimum* extract from the basal location of the leaflet from the leafy part. *Silybum maritimum*



mainly oxygen species (ROS), which are mostly created by UVB absorption. As a result, these pigments shield cells from the damaging effects of intense light radiation. The main analytical techniques used to characterize silybinin from *S. maritimum* are spectroscopy, HPLC, FTIR, and MS-MS [6].

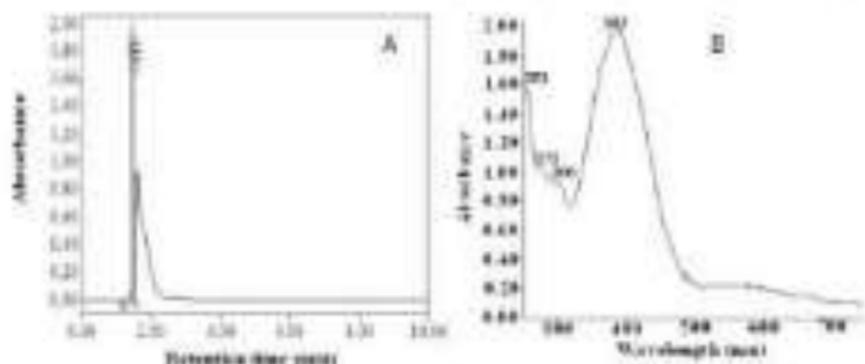
#### HPLC Analysis

By using HPLC, we were able to isolate and partially purify the UV-absorbing pigment silybinin from silybinin-rich crude extract. Silybinin is a flavonoid compound and provides antioxidant activity. Silybinin is a flavonoid compound in the plant silybinin (Cappel and Kerschel 1993; Carozzolo and Quarta-Petrali 2008). Silybinin's main active compounds are silybinin, which is a flavonoid

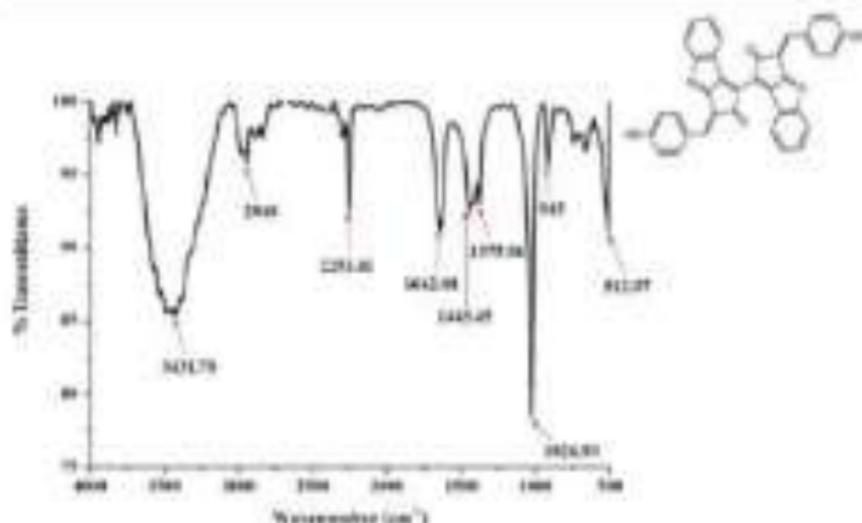
UVB radiation sensor by several ROS (Quarta-Petrali et al. 2002; Serrano and Carozzolo 2007). According to our findings, the silybinin results are where the majority of the flavonoid is not used. As a cellular defense mechanism, the silybinin-rich crude extract from the leafy part of *S. maritimum* is a good source of silybinin (Serrano et al. 2004; Ollivier et al. 2002). The presence of silybinin with absorption maxima at 330 nm was observed through HPLC investigation of the phenolic-rich extract from *S. maritimum* (Fig. 4).

#### FTIR Analysis

FTIR analysis has been used to verify functional groups. According to silybinin's FTIR spectrum (Fig. 5), the phenolic group was responsible for a significant absorption



**Fig 4** High performance liquid chromatography (HPLC) chromatogram of partially purified silybinin (A) and its corresponding ultraviolet spectrum (B) from biological waste parts on the basal location of the leaflet from the leafy part (37 °C, 1.2)



**Fig. 6** Fourier transform infrared (FTIR) spectrum (aqueous suspension) of purified cytosomes against their integral water peaks at the flat baseline of the baseline from pure (fresh chemical analysis of cytosomes)

at  $3421\text{ cm}^{-1}$ , along with the C-H stretching vibrations of alkanes at  $2941\text{ cm}^{-1}$ , the  $\text{C}=\text{O}$  (of phenolic group) at  $1627\text{ cm}^{-1}$ , and C-C stretching, which is typically seen at  $1090\text{--}1320\text{ cm}^{-1}$  and is in line with a recent finding from Lyngby *et al.* and Koyama *et al.* (Parker *et al.* 2020; Koyama *et al.* 2022).

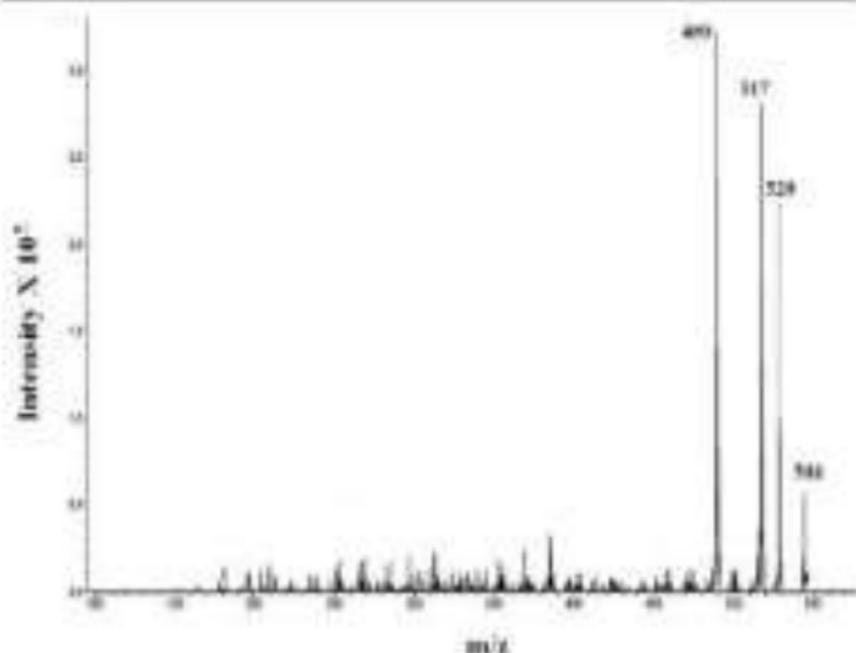
#### ESI-MS/MS Analysis

In a complicated biological sample mixture, HPLC combined with ESI-MS has developed into a very potent technology that can analyze both large and tiny compounds of different polarity. Significant cytosomeic peaks were seen at m/z 225, 217, 432, and 214, which were consistent with cytosomeic data that had been previously published (Koyama *et al.* 2022; Iguchi *et al.* 2004) (Fig. 4). One effective method for identifying and precisely recognizing these substances in ESI-MS/MS analysis. Since there are no marker standards for cytosomeic, the mass spectral data offer a way to identify and describe their substances based on their representative pattern (Parker *et al.* 2017).

Using Koyama cytosomeic, Ishida *et al.* (2005) demonstrated the presence of cytosomeic and carotenoid-like molecules and specific information from cytosomeic regions in both sea/terrestrial fungi. Cytosomeic of species such as *Leucospora*, *Nectria*, *Sphaeria*, *Clavoglyphus*, and *Clavoglyphus* dominated their spores. The majority of these

major cytosomeic are found to be filamentous or colored in shape, which also associated with fungi, mycetozoa, bacteria, algae, and other diverse life *et al.* (2022). Distinguishing surface molecules in the forest world is essential cytosomeic, primarily reflecting the roles in the wild cytosomeic to tropical areas (Parker *et al.* 2017a). Their ability to tolerate high temperatures, desiccation, and protection from intense solar radiation, make them the predominant species that colonize arboreal surfaces in warm temperate to tropical regions (Nishii and Rhee 2017). Despite the fact that these issues are significant in humid and tropical regions, not much is known about the colonization of cytosomeic on the surface of India's forest trees. Despite cytosomeic potential the growth of cytosomeic on the forest environment or habitat on the surface of these forest trees and forest, they exhibit interesting stages of development. The majority of these trees had a distinct/leave appearance because of the cytosomeic's appearance on their surface, which caused some confusion.

The current study's scientific goal was to separate cytosomeic from the habitat under study and release its importance. In the cytosomeic's natural habitat, the forest. The cytosomeic may serve as an indicator of biological cytosomeic colonization on the tree surface. Nevertheless, the study also aimed to draw attention to the forest's pure state and the necessity of protection. This study demonstrates that the 1.8 billion-year-old tree communities of cytosomeic



**Fig. 8** Strategic characterization of some  $m/z$  (403–543) of total lipid fraction of yellowtail flounder from integrated study given at the head location of the fish on day 5 post

a fish's health-based risk, including structural genetic disorders by *Zyprone* that require systematic. However, due to the low changes in fish metabolite composition, the SAs in contrast to this study make an excellent candidate for monitoring human survival factors in both natural and non-natural settings. Understanding how metabolite changes depend on the action of the SAs, which is a significant phenotypic characteristic of metabolic communities due to pigment production (Vita et al. 2022). The ecological and physiological function of these vitamins in SAs has not received much attention.

However, biological processes, including photosynthesis, energy harvesting, detoxification, free radical quenching, antioxidant, cell strength, and protection against thermal stress, depend on pigments (Couture and Caswell 2017; Calzadilla et al. 2021). The primary pigments linked to protection that are associated with the central role include carotenoids, melanins, and xanthones. Xanthones absorb UVB with short wavelengths and can minimize thermal destruction to reduce the energy (Duo et al. 2021). As a result, xanthones intensely influence the making of the SA in natural populations. It not only protects the

organisms that produce it, but it also extends to phylogenetic species in the neighboring cells (Vita et al. 2024). After pigments are absorbed from SAs and rock microalgae, they are separated using biochemical techniques like HPLC, and even at extremely low levels, their identification and quantification are often carried out using MS ESI-MS, FTIR and MS/MS (Munoz-Lobos et al. 2022; Pineda et al. 2023). In a complementary biological sample matrix, HPLC combined with ESI-MS and FTIR has developed into a very potent technology that can analyze both large and low-molecular-weight polycyclic and can evaluate the functional groups found in metabolites (Korhai and Jablon, 2015; Kuroki et al. 2019).

Only polycyclic and aromatics, may offer biological insights on the strategies between biological and geological processes across the whole 1000 million-year history of life on Earth (Armed 1992). Remarkably, the size of the lipid cells in SAs, is quite surprising due to their distribution. This account, along with the role of environmental factors that affect xanthone growth, is crucial for developing conservation strategies to preserve these fossils. By studying and stabilizing rock minerals,

synthesizing one better design work surface through the organic pigments, lactones and conventional resin polymeric substances (PPS), composites, and acid or alkaline reaction (Dugga, Wessén et al. 2010). The creation of EPS, which aids in the formation of biofilms, allows them to colonize in harsh environmental conditions, such as high temperatures, high light levels, and strong UV radiation, as well as extreme desiccation (Mondal et al. 2022). In all of these harsh conditions, organisms are important for their protection (Pahak et al. 2020). Therefore, the development of biofilm on rock surfaces due to scientific and technological (bio) science processes of the mineral matrix is possible by suitable combinations (Dugga-Cohen et al. 1991). That pollen grains, and tiny animals like mites can cross through the varying fissures in the rock's surface, which reduce the mineral pressure on the mineral layer. Microscopic bacteria, unicellular green algae, fungi, mosses, lichens, and probably tiny plants are all supported and identified in the culture and microclimate pre-existence found in the major rock synanthropy. This means the rock fissures to water.

For the long-term sustainability of these biofilm processes, a comprehensive multidisciplinary study and a long-term conservation management strategy are desperately needed. It is impossible to manage environmental elements like temperature, humidity, and light in an entirely stable, but it is possible to manipulate these factors. On the other hand, additional variables and characteristics, such as soil, soil chemistry, and organic material accumulation, can be managed. The use of specific preservatives can also be phytochemical characteristics of the surface of local rocks. To achieve the intended results, a combination of various preservative techniques proved more successful than any one technique alone (Aulund and Aulund 1990; Dugga-Cohen et al. 1999). The following preservatives can also be used for preserving biomass growth: (a) lauryl, (b) regular agar, diox, Eth, and mold cleaning, (c) dead-end dye, (d) biological rock surface cleaning, and (e) biofilm nutrients. Methylated, butadiolone, benzolone, butadiolone, heptane, and propanone water are examples of some of the traditional methods that can be used to maintain and prevent biological growth on the surface of these rocks (Hesse et al. 2017). According to more recent research, more sustainable methods that use a variety of techniques (such as lauryl, UV-C radiation, microwave heating, and monochromatic light) and products such as strychnine or geranyl benzoate applied either pure or in combination with other substances are effective (Brose et al. 2017). Essential oils in aqueous solutions or encapsulated in biodegradable nanoparticles have demonstrated good and widespread inhibitory properties, which has led to a recent increase in interest in the use of sustainable biofilms (Rasidi et al. 2011).

A SVOT analysis is a qualitative method for identifying and assessing a project's opportunities, threats, weaknesses, and strengths (Günay et al. 2024). This project used SWOT analysis for its sustainable development and conservation and strengthening the institution of the local park as a potential post-tourism site. On August 8, 2022, Dindar, the director of the National Park, formally opened it as a local park. In 2015, the main government approved 12.7 million for the restoration of the National Forest Park, a main investment and develop the park as a post-tourism site. The park is located near in Karaman–Mediterranean, border, destination of the park is a geographically important area and to conservation and development would draw visitors all over the globe and would also contribute to the economy of local people. It is crucial to highlight habitat's distinctive geological characteristics, because of the wide-ranging of their scientific relevance, and promote visitor-friendly infrastructure and educational programs for an existing experience if it is to become a post-tourism and post-tourism destination. To encourage environmental growth, which includes regional businesses and other small industries engaged in post-tourism development by providing high-quality, locally sourced goods with the region's natural heritage is required. The majority of post-tourism analysis in India is still qualitative and mostly limited to studies from Rajasthan or Kashmir, with no global approach to methodology (Jazayeri et al. 2020). Despite its numerous scholarly values, the structure, park as habitat is a prime example of naturalized nature. The habitat necessitates park visitors to be assessed in quality for the requirements of the UNESCO Global Geopark. Nevertheless, through documentation that complies with UNESCO's submission guidelines is required. In line with the Global Geopark development, extensive local community awareness initiatives through educational campaigns are essential in highlighting the historical/cultural issues, especially in enhancing awareness about its diversity for indigenous populations. To improve the environmental standing of the ecosystem, cooperative local training programs funded by local government are essential.

## Conclusions

Biocorrosion and carbonate have a significant role in the biogenic weathering of the ancient rocks by promoting the survival of cyanobacteria, which are primarily found in the Middle East and present on these fossils. Biocorrosion is spread first time from the biological mass dominated by cyanobacteria growing on the local habitats in the National forest park. IPCC, FTIR and EDS/EDS data confirmed the bioactive remained significant amount of the pyroxene systems. By forming different colored mineral films

on fish surfaces, microorganisms, especially cyanobacteria, might have these practices. Based on this, bactericide is a way to identify the presence of cyanobacterial colonies and its presence enables them to cope with the harsh environmental conditions it suffers in the wild habitats. We have also noted any concern on the conservation of this park as a promising ecological heritage site in Ceará, Brazil. Although this local park has a lot of potential, preservation is desperately needed. Because of its broad ecological exposure, this park has great potential as a heritage site. The park satisfies all requirements to be designated as a Global Geopark. It is imperative to complete the required steps to apply for UNESCO confirmation, supporting sustainable development by ensuring the standard of living for the local tribes and promoting community-driven conservation of the area's ecological heritage.

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## Declarations

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# Influence of Gratitude, Humility and Meaning in Life on Mental Health of College Students in Uttar Pradesh, India: A Questionnaire Case Study

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## Authors' contributions

This work was carried out in collaboration between both authors. Author SG has taken the responsibility of conceptualization, investigation, data collection, data analysis and drafting the research manuscript. Author MP has taken the responsibility of writing and editing the manuscript. Both authors read and approved the final manuscript.

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## ABSTRACT

This study investigates the predictive influence of gratitude and family systems team with meaning in life serving as a mediating variable among college students. A sample of 210 undergraduate students participated in the research, completing self-report standardized measures of gratitude, humility, meaning in life, and mental health. Using correlation and mediation analysis through a structural equation model, the findings revealed significant positive direct and indirect

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relationship between the variables. Both gratitude and humility showed strong direct associations with improved mental health outcomes. Additionally, meaning in life was found to fully mediate the relationship between humility and mental health, and partially mediate the relationship between gratitude and mental health. This suggests that gratitude and humility enhance an individual's sense of life meaning, which in turn contributes to better mental health. The results highlight the interconnected role of character strengths and existential meaning in promoting psychological well-being among college students.

These findings provide empirical evidence in favor of positive psychology theories and point towards aspects that may be taken into consideration in order to enhance college students' mental health and sense of meaning in life.

**Keywords:** Gratitude, Humility, Mental Health, Meaning in Life, Existential Theory

## 1. INTRODUCTION

In a time when rates of anxiety, depression, and existential distress are rising (World Health Organization, 2022), psychological research is putting more emphasis on strength-based methods. Gratitude and humility, two key components of positive psychology, have been shown to improve social functioning and well-being. Fostering meaning in life—the conviction that existence has a meaning and purpose—has also emerged as a crucial component in promoting psychological distress (Seligman et al., 2005).

Psychology has historically viewed the systematic investigation of individual variations in appreciation (McCullough et al., 2001). A major branch of studies on happy emotions may be the cause of this consensus (Duckworth et al., 2005; Lomas et al., 2018).

Humility and gratitude frequently overlap and encourage virtuous contemplation. According to Fiske et al. (2014), humility is fostered by gratitude, and both traits support human development. However, there is still a lack of empirical research on their combined impact on mental health when viewed through the prism of this purpose. The study examines the current state of research, identifies important gaps—particularly the absence of integrative models—and highlights implications for mental health interventions by utilizing empirical data and theoretical models, such as existential positive psychology and the broaden-and-build theory.

Although humility and gratitude have been shown to independently correlate with mental health, their indirect impacts through life meaning have not received enough attention. According to empirical research, a conceptual framework and

suggestions for further study are presented in this discussion.

### 1.1 Theoretical Framework: Relevance of Supported Theories

With success in life acting as a mediating factor, the current study examines how humility and gratitude serve as positive factors for mental health. The suggested connections between these factors are supported both empirically and theoretically by a variety of psychological theories, which form the foundation of the conceptual framework.

#### 1. Positive Psychology Theory (Seligman & Csikszentmihalyi, 2000)

The focus of positive psychology is on how human qualities and strengths might improve psychological well-being. According to the *Virtue Classification of Character Strengths and Virtues* (Peterson & Seligman, 2004), humility and gratitude are categorized as vice virtues, signifying fundamental components that support a happy existence. According to Seligman (2002), cultivating positive attitudes like humility, which promotes interpersonal peace, and gratitude, which improves subjective well-being, can help one achieve well-being.

According to this theoretical framework, finding purpose in life is essential to well-being. It is a result of humility and gratitude, but it also acts as a conduit for the positive effects of these qualities on mental health. Therefore, this hypothesis takes up the idea that purpose in life acts as a mediator between mental health and the determinants of gratitude and humility.

#### 2. Existential Theory (Frankl, 1946)

According to Viktor Frankl's Logotherapy, people are motivated primarily by their "will to meaning."

Recent highlights that people may forego their own and their psychological stability by trying purpose work in trying situations. This theory holds that trying purpose in life is a basic factor that determines mental health rather than only acting as a buffer.

As essential virtues, humility and gratitude promote an openness to life events and an understanding of interconnectedness, both of which make it easier to find and feel meaning. Thus, this theory offers a compelling justification for the role that meaning in life plays as a mediator in the connection between mental health, gratitude, and humility.

## 2. Broaden-and-Build Theory of Positive Emotions (Fredrickson, 2001)

According to Fredrickson's Broaden-and-Build Theory, people can develop long-lasting personal resources (such as psychological, cognitive, and social ones) by accumulating their thought-action repertoires through positive emotions like gratitude. By encouraging positive assessments that support pro-social, prosocial conduct, and a feeling of purpose, gratitude raises awareness of life benefits (Fredrickson, 2001).

This upward cycle eventually leads to a deeper sense of meaning in life, which improves mental health by lowering stress, anxiety, and depressive symptoms. In a similar way, humility promotes acceptance and openness, which strengthens the ability to find significance in life experiences.

## 2. LITERATURE REVIEW AND HYPOTHESES FORMULATION

### 2.1 Gratitude and Mental Health

Well-being, life satisfaction, and less psychological distress are all positively correlated with gratitude (Wood et al., 2010). According to research by Ross et al. (2011) and Emmons and McCullough (2003), people who feel grateful are happier and experience less depression. Over the course of four weeks, gratitude-based therapies consistently improved life satisfaction and decreased depressive symptoms. In a study of 48 people, Frohne and Kuykendall (2019) found that experimental gratitude was a rapid predictor of depression. This research has been focused on direct impacts, empirical testing of mediation through life meaning is rare. Better

mental health is a result of gratitude (Lin, 2017). Better psychological well-being has been repeatedly associated with gratitude, which is the acknowledgment and appreciation of pleasant elements of life and other people.

Gratitude has been shown in several studies to positively correlate with mental health markers, including improved life satisfaction and decreased symptoms of anxiety and depression (Emmons & McCullough, 2003; Wood et al., 2010). People who are grateful are more likely to have robust coping strategies and good affect. According to Taylor (2018), gratitude also improves prosocial behavior and social support, which lowers stress and boosts emotional regulation. According to some research, having appreciation makes life more meaningful, which is an important mental health.

Will Gratitude have a positive and significant effect on mental health?

### 2.2 Humility and Mental Health

Better social interactions and less narcissism are associated with humility, which is described as having a positive self-perception and being receptive to the qualities of others (Ehrlich & Hill, 2012). Less focus has been placed on its direct connection to mental health, though. Despite their theoretical relationship (Delmon et al., 2007), modesty and humility are not the same thing. According to Davis et al. (2012), humility is a predictor of forgiveness, less narcissism, and enhanced well-being. Young people who are psychologically humble had reduced levels of anxiety and distress (Kuan et al., 2017).

In positive psychology, humility—which is characterized by low self-focus, receptivity to the opinions of others, and an accurate self-evaluation—has shown increasing attention. According to research, humility has a good correlation with psychological well-being and a negative correlation with narcissism. Because they build stronger ties with others, humble people typically have lower levels of social anxiety and distress.

According to Davis et al. (2012), humility promotes forgiveness and compassion among people, which lowers interpersonal stress and enhances mental health. Additionally, it has the potential to improve psychological resilience by strengthening meaning-making processes. This supports Fredrickson's Broaden-and-Build Theory.

H3: Humility has a positive and significant effect on mental health.

### 2.2 Gratitude and Meaning in Life

Gratitude, commonly defined as a disposition or emotional state involving appreciation for benefits received, has been increasingly recognized as a key component of psychological well-being and existential fulfillment. A growing body of empirical research supports the positive and significant effect of gratitude on individuals' perceived meaning in life. Steger et al. (2008) introduced the construct of meaning in life, emphasizing its importance for psychological well-being. Later studies, such as those by Wood et al. (2009), found that gratitude is a state that correlates positively with both meaning in life and overall well-being. They concluded that grateful individuals tend to view their lives as more meaningful and purposeful, possibly because gratitude fosters the reflection and appreciation of relationships and experiences.

H4: Gratitude has a positive and significant effect on meaning in life.

### 2.4 Humility and Meaning in Life

One of the best indicators of mental wellness is having a strong sense of purpose in life. According to Steger et al. (2008), it serves as an emotional and motivational regulator. Humility fosters a reflective life perspective, openness to feedback, and an appreciation for the broader context of one's life—all recognized pathways to cultivating meaning (Wong, 2011). By reducing excessive self-focus and promoting acceptance of one's limitations, humility encourages individuals to find significance and purpose in relationships, learning, and service to others.

Rose and Wright (2005) reported that in college students and older adults, higher humility was associated with less depression, less anxiety, more love of life, and stronger social self-efficacy. Importantly, these benefits appear across various domains of humility (e.g., other-oriented, environmental, valuing). By promoting open-mindedness, accurate self-appraisal, and genuine engagement with others and the world, humility acts as a foundation for psychological flourishing and meaningful living. Hence, there is still a dearth of research on humility with meaning in life.

H4: Humility has a positive and significant effect on meaning in life.

### 2.6 Meaning in Life with Gratitude and Mental Health

One of the best indicators of mental health is meaning in life (MIL), or the belief that one's life has meaning and purpose. Research confirms that people who have a strong sense of purpose report feeling less depressed, anxious, and considering suicide (Steger et al., 2008). MIL is also associated with improved self-esteem, goal clarity, and happy feelings. Empirical work by Lambert et al. (2010) found that gratitude interventions increased perceived meaning in life. The link between mental health and positive psychological qualities (such as gratitude, hope, and spirituality) is mediated by meaning in life. For instance, Le (2015) discovered that among Chinese teenagers, MIL mediated the relationship between gratitude and reduced anxiety.

H5: Meaning in life mediates the relationship between Gratitude and Mental Health.

### 2.8 Meaning in Life with Humility and Mental Health

Meaning in life is commonly defined as the degree to which individuals perceive their lives as purposeful, coherent, and significant. It encompasses both the search for meaning and the presence of meaning, which respectively reflect ongoing life-exploration and goal fulfillment. A strong sense of meaning in life is a robust predictor of better mental health, significantly reducing symptoms of anxiety, depression, and psychological distress (Lopez et al., 2004). When individuals seek meaning, they are more prone to psychological difficulties.

A deeper comprehension of one's own values and purpose is made possible by humility, which increases receptivity to existential inquiry (Kross, 2013). A recent publication by Chirkov et al. (2015) demonstrates that elevated humility is associated with greater meaning in life and flourishing, along with lower levels of psychological distress such as anxiety and depression. These findings suggest that meaning in life serves as a key mediator of pathways explaining how humility exerts its effects on mental health. According to Kross et al. (2014), humility and meaning in life both promote human development. However, there is still a lack of empirical research on their combined impact on mental health through life's meaning.

H4: Meaning in life mediates the relationship between Humility and Mental Health.

## 2. PROPOSED CONCEPTUAL MODEL

The figure below illustrates the conceptual model for this study based on the above-mentioned hypothesis.

According to the model above, mental health (including depression, anxiety, and overall well-being) is the criterion variable, meaning that life acts as a mediator, and humility and gratitude act as predictor factors.



Fig. 1. A conceptual model which represents the relationship among predictor, mediator and criterion.

## 4. METHOD

### Sample:

Through the use of stratified questionnaires, the current study was carried out on 210 college students from Degree College Raibetawi (Jibar Firdaus) in India, all of whom were 100% between the ages of 18 and 28. This ensured a targeted representation of young adult learners in higher education. Individuals across cultural backgrounds.

### Instruments:

- Gratitude Questionnaire:** Gratitude Questionnaire-6 (GQ-6; McCullough et al., 2002). The Gratitude Questionnaire-6 Item Form (GQ-6) is a widely used, brief self-report measure of dispositional gratitude. It assesses individual differences in the tendency to experience gratitude in daily life. The scale consists of six statements and respondents rate their agreement with each statement using a 7-point Likert scale. Cronbach alpha value is 0.84.

- Healthy Humility Inventory:** This 11-item Healthy Humility Inventory (Guinn, 2009) invites participants to rate their own qualities of healthy humility on a 6-point Likert scale. It mean score was determined using items ranging from 1 (not at all like me) to 6 (very much like me), with higher scores indicating higher levels of healthy humility (Cronbach's  $\alpha = 0.82$  at time 1). Among college students, this measure has shown strong psychometric qualities.
- Meaning in Life Questionnaire:** Steger et al. (2006) created the Meaning in Life Questionnaire (MLQ). Two distinct structures make up the 10 items that make up the MLQ. Ten items associated with a seven-point Likert scale are used to measure each facet of this instrument. Higher scores indicate a greater presence of meaning and a greater desire for meaning; the scores range from 10 to 70. The goal of the meaning subscale has one question (item 8) that has reverse coding. Cronbach's alpha scores for both subscales in the normative sample ranged from 0.82 to 0.85. Among college students, this measure has shown strong psychometric qualities.

• **Mental Health Questionnaire:** Dugas and Singh's Mental Health Scale, which consists of 10 items. A five-point Likert scale is used to score the items: 1 means "strongly disagree," 2 means "moderately disagree," 3 means "neutral," 4 means "moderately agree," and 5 means "strongly agree." The dimension of psychological distress is used in reverse: (Items 1, 4, 11, 12, 13, 14, 15, and 16 have reverse scoring). We then summed everything. Strong internal consistency and other psychometric qualities are demonstrated by MHS (Cronbach's alpha of 0.92).

## 6. RESULTS AND DISCUSSION

### 6.1 Statistical Approach

All surveys were scored in accordance with national guidelines. SPSS 25 was used to assist in the data analysis. To maintain low humility and life meaning rates to the

prediction of mental health, a correlations study was conducted. To evaluate the hypotheses between gratitude, meaning, and internal variables, hierarchical regression analysis and mediation were also conducted using MEDIATE PROCSSIS. The computation of descriptive statistics, which are displayed in Table 1, is one of the statistics used in the inquiry. Features of the sample's demographics (n=210). There are 28.0% female and 71.4% male college students in National Life Products, Inc.

A rich framework for understanding psychological variables like Gratitude, Humility, meaning in life, and mental health is provided by the demographic variety in terms of geography, gender, socioeconomic class, and health status. Variables in these attributes give the study more external validity and enable subsequent comparisons in our inferential analysis. Table 2 displays the correlation coefficient, which was calculated using descriptive statistics.

Table 1. Demographic characteristics of sample (n=210)

S. No.	Demographic Variable	Number and Percentage
1.	Age (in years)	210 (100%)
	18-24	
2.	Gender	
	Male	71.4
	Female	28.1
3.	Area	
	Rural	35.7
	Semi-urban	20.7
	Urban	38.8
4.	Health	
	Poor	4.3
	Good	93.2
	Very good	47.2
	Excellent	31.9
5.	Income class	
	Lower	20.7
	Middle	38.8
	Upper	31.7

Table 2. Descriptive statistics and correlation coefficient between studied variables

	Mean	Standard deviation (SD)	1	2	3	4
Humility	41.25	13.10	-			
Gratitude	25.33	7.33	.422**	-		
Meaning in Life	43.96	11.44	.567**	.549**	-	
Mental health	55.33	11.58	.422**	.498**	.382**	-

\*\*p < .001, \*\*\*p < .001.

The Pearson correlation coefficients between the four main psychological variables in the study—mental health, gratitude, humility, and meaning in life—are shown in Table 2. In a sample of 210

college students, the analysis aids in understanding the direction and degree of correlations between these dimensions. To determine the link between the variables under study, the correlation coefficient was computed. Table 2 displayed the findings from the co-variance analysis. There was a substantial positive correlation between humility and gratitude (.403,  $p < 0.01$ ) as well as between humility and mental health (.425,  $p < 0.01$ ) and life meaning (.557,  $p < 0.01$ ). Table 2 also showed a significant correlation between gratitude and mental health (.498,  $p < 0.01$ ) and life meaning (.545,  $p < 0.01$ ). Likewise, there was a significant correlation between mental health and meaning in life (.398,  $p < 0.01$ ).

**Table 3. Model coefficient for the simple mediation model for humility, mental health and meaning in life**

Predictor Variable(s)	ML (Meaning in Life)			V (Mental Health)				
	B	SE	F	B	SE	F		
Humility (H <sub>1</sub> )	a	0.04	0.02	.000	c'	0.34	0.02	.000
Meaning in Life (ML)				b	0.21	0.07	.000	
Humility (H <sub>2</sub> )				c	0.43	0.07	.000	

Note.  $H_1$  =  $H_2$  = 2d - standard error;  $B$  = unstandardized coefficient;  $H_1$  = independent variable (humility);  $a$  = path a, the association between the independent variable (Humility) and mediator (meaning in life);  $b$  = path b, the association between the mediator (meaning in life) and dependent variable (mental health);  $c'$  = path c', the direct effect of the independent variable (humility) on the dependent variable (mental health);  $c$  = the total effect of the independent variable (humility) on the dependent variable (mental health).

- Path a ( $H_1$ —ML): The co-efficient  $B = 0.04$ ,  $p < 0.000$ , indicates a significant positive relationship between Humility and Meaning in Life. Higher Humility perceived higher meaning in life.
- Path b (ML—MH): The coefficient  $B = 0.21$ ,  $p < 0.004$  shows a significant positive relationship between meaning in life and Mental health.
- Path c' (Direct Effect,  $H_2$ —MH) controlling of ML: After accounting for meaning in life, the direct effect of  $H_2$  on MH is  $B = 0.43$ ,  $p < 0.000$ , which is positively significant.
- Path C (Total Effect,  $H_1$ —MH): The total effect of  $H_1$  on MH is  $B = 0.45$ ,  $p < 0.000$ , indicating that  $H_1$  positively impacts MH before considering the mediator.

**Table 4. Indirect effect of humility on mental health**

Predictor variable	B	SE	F	LLCI	ULCI
Humility (H <sub>1</sub> )	0.14	0.05	.000	0.03	0.25

Note.  $LLCI$  = lower limit of the confidence interval;  $ULCI$  = upper limit of the interval.

**Table 5. Model coefficient for the simple mediation model for gratitude, meaning in life, and mental health**

Predictor Variable	ML (Meaning in Life)			V (Mental Health)				
	B	SE	F	B	SE	F		
Gratitude(G)	a	0.01	0.03	.000	c'	0.06	0.11	.000
Meaning in Life (ML)				b	0.17	0.07	.000	
Gratitude (G)				c	0.21	0.38	.000	

The Pearson correlation coefficients between the four main psychological variables in the study—mental health, gratitude, humility, and meaning in life—were shown in Table 2. In a sample of 210 college students, the analysis aids in understanding the direction and degree of correlations between these dimensions. To determine the link between the variables under study, the correlation coefficient was computed. Table 2 displayed the findings from the co-

variance analysis. There was a substantial positive correlation between humility and gratitude (.403,  $p < 0.01$ ) as well as between humility and mental health (.425,  $p < 0.01$ ) and life meaning (.557,  $p < 0.01$ ). Table 2 also showed a significant correlation between gratitude and mental health (.498,  $p < 0.01$ ) and meaning in life (.545,  $p < 0.01$ ). Likewise, there was a significant correlation between mental health and meaning in life (.398,  $p < 0.01$ ).

**Table 6. Indirect effect of gratitude on mental health.**

Mediator Variable	B	SE	P	LLCI	ULCI
Gratitude	0.15	0.06	0	0.04	0.24

Note: non-standardized beta; confidence interval of LL (lower limit) of the interval; UL (upper limit) of the interval.

### 6.3 Hypotheses And Path Coefficients

**Table 7. Direct effects: regression path coefficients.**

Hypothesis	Path	B	SE	p-value
H1	Gratitude → Mental Health (c)	0.32	0.11	.003
H2	Humility → Mental Health (c)	0.34	0.09	.003
H3	Gratitude → Meaning in Life (a)	0.25	0.03	.000
H4	Humility → Meaning in Life (a)	0.24	0.03	.003

#### Direct Effects (Table 7)

The regression analysis revealed several significant direct relationships between the studied psychological constructs:

**H1:** Gratitude also had a strong direct effect on Mental Health ( $B = 0.32$ ,  $SE = 0.11$ ,  $p < .001$ ), indicating that more grateful individuals tend to have better mental well-being.

**H2:** Humility significantly predicted Mental Health ( $B = 0.34$ ,  $SE = 0.09$ ,  $p < .001$ ), suggesting that individuals with higher humility reported better mental health outcomes.

**H3:** Gratitude strongly predicted Meaning in Life ( $B = 0.25$ ,  $SE = 0.03$ ,  $p < .001$ ), implying that grateful individuals tend to find greater meaning in their lives.

**H4:** Humility was positively associated with Meaning in Life ( $B = 0.24$ ,  $SE = 0.03$ ,  $p < .001$ ), suggesting that humility contributes to a deeper sense of purpose and significance.

Thus, the results provide robust evidence that both humility and gratitude influence mental health, not only directly but also through their contribution to meaning in life.

### 6.3 Indirect Effects / Mediation (Table 5)

**H5:** The indirect effect of gratitude on mental health via meaning in life was also significant ( $B$

$= 0.15$ ,  $SE = 0.06$ ,  $p < .001$ , 95% CI [0.04, 0.24]), confirming that meaning in life mediates the relationship between gratitude and mental health.

**H6:** The indirect effect of humility on mental health through meaning in life was significant ( $B = 0.14$ ,  $SE = 0.05$ ,  $p < .001$ , 95% CI [0.03, 0.25]). This supports the partial mediation model, where meaning in life explains part of humility's impact on mental health.

The confidence intervals for both indirect effects do not include zero, further validating the significance of mediation.

The results provide compelling empirical evidence in favour of a mediated paradigm in which gratitude and humility have a direct and indirect positive impact on mental health through increased life meaning.

### 6.4 Discussion

A comprehensive mediation study ( $N = 210$ ) revealed that humility was a predictor of more life meaning ( $\beta = 0.04$ ,  $SE = 0.02$ ,  $p < .001$ ). Consequently, after adjusting for humility, meaning mediated increased mental health ( $\beta = 0.21$ ,  $SE = 0.07$ ,  $p < .001$ ). According to 5000 bias-corrected bootstraps, the indirect impact was significant, with 40 = 0.13, 95 percent CI [04, 23]. Humility continued to have a substantial direct impact on mental health ( $\beta = 0.34$ ,  $SE = 0.09$ ,  $p < .001$ ), suggesting serial mediation.

**Table 8. Indirect effects: (Mediation analysis)**

Hypothesis	Indirect Path	B	SE	p-value	95% CI (LLCI, ULCI)
H5	Gratitude → ML → MH	0.15	0.06	.003	[0.04, 0.24]
H6	Humility → ML → MH	0.14	0.05	.003	[0.03, 0.25]

According to these results, people with high levels of humility are more likely to believe that their lives have purpose, which improves their mental health by Chikudate et al. (2005).

Although a large part of the association may be explained by purpose in life, humility also directly predicts mental health outcomes, most likely through processes relating improved emotional regulation, healthier interpersonal interactions, and less self-focus. Therefore, cultivating humility may both directly and indirectly promote mental health, in part by strengthening a person's sense of purpose and coherence in life.

There was partial mediation of the statistically significant indirect impact of Gratitude on mental health through meaning in life (in  $\beta = 0.14$ ,  $SE(\beta) = 2.34$ ,  $p < .001$ ). After controlling for the meaning, the direct impact of gratitude on mental health was still significant ( $\beta = 0.02$ ,  $SE = 0.11$ ,  $p < .001$ ), and the overall effect was substantial ( $\beta = 0.01$ ,  $SE = 0.03$ ,  $p < .001$ ). These results may be that the beneficial association between gratitude and mental health is partially mediated by meaning in life, thus supporting better mental health is a result of gratitude.

According to these results, those who are more grateful are more inclined to believe that their lives have purpose, which improves their mental health. The existence of a noteworthy indirect impact implies that this purpose serves as a key psychological mechanism via which gratitude operates, without, however, the substantial and noteworthy direct effect also suggests that gratitude has an independent impact on mental health, maybe via additional channels like better coping with better relationships, or better emotional control.

The current study's findings add to the existing corpus of research examining the psychological determinants of college students' mental health. The findings support the notion that mental health and its purpose are positively connected with both humility and meaning as by Lambert et al. (2012). A mediating function of meaning in life helps to explain how these personal qualities contribute to improved mental health outcomes. These results provide evidence to positive psychology theoretic frameworks that highlight the role of existential significance and virtue-based characteristics in promoting psychological well-being.

According to the mediator of meaning in life, people who feel grateful or excited are more likely to report feeling more purposeful, which improves their mental health. This provides the incorporation of meaning-oriented treatments into constructive mental health practices and emphasizes the importance of existential resources in mental health interventions.

## 6. CONCLUSION

This study comes to the conclusion that, both directly and indirectly through finding purpose in life, humility and Gratitude are strong, validated indicators of mental health. The results highlight the crucial role of positive character traits and a strong sense of meaning in life in order to improve young people's mental health. The research offers a greater knowledge of the psychological mechanisms connecting good qualities to mental well-being by demonstrating the mediating function of meaning in life.

## 7. LIMITATIONS

This work has many limitations despite its significant contributions.

1. First, causal inference is limited by the cross-sectional design.

To verify the directionality of the correlations between variables, longitudinal research is required.

2. Second, response biases might be introduced by depending too much on self-reported data.
3. Third, the results may not be as broadly applicable as they may be because the sample was restricted to college students in a particular demographic area.

## 8. FUTURE IMPLICATIONS

These connections between various demographics and cultural variations may be investigated in future studies. The effectiveness of interventions designed to increase gratitude and humility in fostering a sense of purpose in life and benefiting mental health should be assessed. Furthermore, experimental and longitudinal research can support the establishment of causation and the long-term persistence of these psychological effects. The good development and mental health of young people might be greatly enhanced by creating

educational and counseling programs centered on these qualities and existential issues.

#### DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, Copilot, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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# Influence of Gratitude, Humility and Meaning in Life on Mental Health of College Students in Uttar Pradesh, India: A Questionnaire Case Study

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## Authors' contributions

This work was carried out in collaboration between both authors. Author SG has taken the responsibility of conceptualization, investigation, data collection, data analysis and drafting the research manuscript. Author MP has taken the responsibility of writing and editing the manuscript. Both authors read and approved the final manuscript.

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## ABSTRACT

This study investigates the predictive influence of gratitude and family systems team with meaning in life serving as a mediating variable among college students. A sample of 210 undergraduate students participated in the research, completing self-report standardized measures of gratitude, humility, meaning in life, and mental health. Using correlation and mediation analysis through a structural equation model, the findings revealed significant positive direct and indirect

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relationship between the variables. Both gratitude and humility showed strong direct associations with improved mental health outcomes. Additionally, meaning in life was found to fully mediate the relationship between humility and mental health, and partially mediate the relationship between gratitude and mental health. This suggests that gratitude and humility enhance an individual's sense of life meaning, which in turn contributes to better mental health. The results highlight the interconnected role of character strengths and existential meaning in promoting psychological well-being among college students.

These findings provide empirical evidence in favor of positive psychology theories and point towards aspects that may be taken into consideration in order to enhance college students' mental health and sense of meaning in life.

**Keywords:** Gratitude, Humility, Mental Health, Meaning in Life, Existential Theory

## 1. INTRODUCTION

In a time when rates of anxiety, depression, and existential distress are rising (World Health Organization, 2022), psychological research is putting more emphasis on strength-based methods. Gratitude and humility, two key components of positive psychology, have been shown to improve social functioning and well-being. Finding meaning in life—the conviction that existence has a meaning and purpose—has also emerged as a crucial component in promoting psychological distress (Seger et al., 2020).

Psychology has historically viewed the systematic investigation of individual variations in appreciation (McCleugh et al., 2021). A major branch of studies on happy emotions may be the cause of this consensus (Duhon et al., 2020; Limay et al., 2020).

Humility and gratitude frequently overlap and encourage virtuous contemplation. According to Fiske et al. (2014), humility is fostered by gratitude, and both traits support human development. However, there is still a lack of empirical research on their combined impact on mental health when viewed through the prism of this purpose. The study examines the current state of research, identifies important gaps—particularly the absence of integrative models—and highlights implications for mental health interventions by utilizing empirical data and theoretical models, such as existential positive psychology and the broaden-and-build theory.

Although humility and gratitude have been shown to independently correlate with mental health, their indirect impacts through life meaning have not received enough attention, according to empirical research. A conceptual framework and

suggestions for further study are presented in this discussion.

### 1.1 Theoretical Framework: Relevance of Supported Theories

With success in life acting as a mediating factor, the current study examines how humility and gratitude serve as positive factors for mental health. The suggested connections between these factors are supported both empirically and theoretically by a variety of psychological theories, which form the foundation of the conceptual framework.

#### 1. Positive Psychology Theory (Seligman & Csikszentmihalyi, 2000)

The focus of positive psychology is on how human qualities and strengths might improve psychological well-being. According to the 19th Dissertation of Character Strengths and Virtues (Peterson & Seligman, 2004), humility and gratitude are categorized as core virtues, signifying fundamental components that support a happy existence. According to Seligman (2002), cultivating positive attitudes like humility, which promotes interpersonal peace, and gratitude, which improves subjective well-being, can help one achieve well-being.

According to this theoretical framework, finding purpose in life is essential to well-being. It is a result of humility and gratitude, but it also acts as a conduit for the positive effects of these qualities on mental health. Therefore, this hypothesis takes up the idea that purpose in life acts as a mediator between mental health and the determinants of gratitude and humility.

#### 2. Existential Theory (Frankl, 1962)

According to Viktor Frankl's Logotherapy, people are motivated primarily by their "will to meaning."

Recent highlights that people may forego their own and their psychological stability by trying purpose work in trying situations. This theory holds that trying purpose in life is a basic factor that determines mental health rather than only acting as a buffer.

As essential virtues, humility and gratitude promote an openness to life events and an understanding of interconnectedness, both of which make it easier to find and feel meaning. Thus, this theory offers a compelling justification for the role that meaning in life plays as a mediator in the connection between mental health, gratitude, and humility.

## 2. Broaden-and-Build Theory of Positive Emotions (Fredrickson, 2001)

According to Fredrickson's Broaden-and-Build Theory, people can develop long-lasting personal resources (such as psychological, cognitive, and social ones) by accumulating their thought-action repertoires through positive emotions like gratitude. By encouraging positive assessments that support pro-social, prosocial conduct, and a feeling of purpose, gratitude raises awareness of life benefits (Fredrickson, 2001).

This upward cycle eventually leads to a deeper sense of meaning in life, which improves mental health by lowering stress, anxiety, and depressive symptoms. In a similar way, humility promotes acceptance and openness, which strengthens the ability to find significance in life experiences.

## 2. LITERATURE REVIEW AND HYPOTHESES FORMULATION

### 2.1 Gratitude and Mental Health

Well-being, life satisfaction, and less psychological distress are all positively correlated with gratitude (Wood et al., 2010). According to research by Ross et al. (2011) and Emmons and McCullough (2000), people who feel grateful are happier and experience less depression. Over the course of four weeks, gratitude-based therapies consistently improved life satisfaction and decreased depressive symptoms. In a study of 428 people, Frohne and Kuykendall (2016) found that dispositional gratefulness was a significant predictor of depression. Prior research has been focused on direct impacts, empirical testing of mediation through life meaning is rare. Better

mental health is a result of gratitude (Lin, 2017). Better psychological well-being has been repeatedly associated with gratitude, which is the acknowledgment and appreciation of pleasant elements of life and other people.

Gratitude has been shown in several studies to positively correlate with mental health markers, including improved life satisfaction and decreased symptoms of anxiety and depression (Emmons & McCullough, 2000; Wood et al., 2010). People who are grateful are more likely to have robust coping strategies and good affect. According to Taylor (2010), gratitude also improves prosocial behavior and social support, which lowers stress and boosts emotional regulation. According to some research, having appreciation makes life more meaningful, which is an important mental health.

H1: Gratitude has a positive and significant effect on mental health.

### 2.2 Humility and Mental Health

Better social interactions and less narcissism are associated with humility, which is described as having a positive self-perception and being receptive to the qualities of others (Ehrlich & Hill, 2012). Less focus has been placed on its direct connection to mental health, though. Despite their theoretical relationship (Delmonico et al., 2007), modesty and humility are not the same thing. According to Davis et al. (2013), humility is a predictor of forgiveness, less narcissism, and enhanced well-being. Young people who are psychologically humble had reduced levels of anxiety and distress (Kuan et al., 2017).

In positive psychology, humility—which is characterized by low self-focus, receptivity to the opinions of others, and an accurate self-evaluation—has shown increasing attention. According to research, humility has a good correlation with psychological well-being and a negative correlation with narcissism. Because they build stronger ties with others, humble people typically have lower levels of social anxiety and distress.

According to Davis et al. (2013), humility promotes forgiveness and compassion among people, which lowers interpersonal stress and enhances mental health. Additionally, it has the potential to improve psychological resilience by strengthening meaning-making processes. This supports Fredrickson's Broaden-and-Build Theory.

H3: Humility has a positive and significant effect on mental health.

### 2.2 Gratitude and Meaning in Life

Gratitude, commonly defined as a disposition or emotional state involving appreciation for benefits received, has been increasingly recognized as a key component of psychological well-being and existential fulfillment. A growing body of empirical research supports the positive and significant effect of gratitude on individuals' perceived meaning in life. Steger et al. (2008) introduced the construct of meaning in life, emphasizing its importance for psychological well-being. Later studies, such as those by Wood et al. (2009), found that gratitude is a state that correlates positively with both meaning in life and overall well-being. They concluded that grateful individuals tend to view their lives as more meaningful and purposeful, possibly because gratitude fosters the reflection and appreciation of relationships and experiences.

H4: Gratitude has a positive and significant effect on meaning in life.

### 2.4 Humility and Meaning in Life

One of the best indicators of mental wellness is having a strong sense of purpose in life. According to Steger et al. (2008), it serves as an emotional and motivational regulator. Humility fosters a reflective life perspective, openness to feedback, and an appreciation for the broader context of one's life—all recognized pathways to cultivating meaning (Wong, 2011). By reducing excessive self-focus and promoting acceptance of one's limitations, humility encourages individuals to find significance and purpose in relationships, learning, and service to others.

Rose and Wright (2005) reported that in college students and older adults, higher humility was associated with less depression, less anxiety, more love of life, and stronger social self-efficacy. Importantly, these benefits appear across various domains of humility (e.g., other-oriented, environmental, valuing). By promoting open-mindedness, accurate self-appraisal, and genuine engagement with others and the world, humility acts as a foundation for psychological flourishing and meaningful living. Hence, there is still a dearth of research on humility with meaning in life.

H4: Humility has a positive and significant effect on meaning in life.

### 2.6 Meaning in Life with Gratitude and Mental Health

One of the best indicators of mental health is meaning in life (MIL), or the belief that one's life has meaning and purpose. Research confirms that people who have a strong sense of purpose report feeling less depressed, anxious, and considering suicide (Steger et al., 2008). MIL is also associated with improved self-esteem, goal clarity, and happy feelings. Empirical work by Lambert et al. (2010) found that gratitude interventions increased perceived meaning in life. The link between mental health and positive psychological qualities (such as gratitude, hope, and spirituality) is mediated by meaning in life. For instance, Le (2015) discovered that among Chinese teenagers, MIL mediated the relationship between gratitude and reduced anxiety.

H5: Meaning in life mediates the relationship between Gratitude and Mental Health.

### 2.8 Meaning in Life with Humility and Mental Health

Meaning in life is commonly defined as the degree to which individuals perceive their lives as purposeful, coherent, and significant. It encompasses both the search for meaning and the presence of meaning, which respectively reflect ongoing life-exploration and goal fulfillment. A strong sense of meaning in life is a robust predictor of better mental health, significantly reducing symptoms of anxiety, depression, and psychological distress (Lopez et al., 2004). When individuals seek meaning, they are more prone to psychological difficulties.

A deeper comprehension of one's own values and purpose is made possible by humility, which increases receptivity to existential inquiry (Krause, 2012). A recent publication by Chirkov et al. (2015) demonstrates that elevated humility is associated with greater meaning in life and flourishing, along with lower levels of psychological distress such as anxiety and depression. These findings suggest that meaning in life serves as a key mediator of pathways explaining how humility exerts its effects on mental health. According to Krause et al. (2014), humility and meaning in life both promote human development. However, there is still a lack of empirical research on their combined impact on mental health through life's meaning.

H4: Meaning in life mediates the relationship between Humility and Mental Health.

## 2. PROPOSED CONCEPTUAL MODEL

The figure below illustrates the conceptual model for this study based on the above-mentioned hypothesis.

According to the model above, mental health (including depression, anxiety, and overall well-being) is the criterion variable, meaning that life acts as a mediator, and humility and gratitude act as predictor factors.



Fig. 1. A conceptual model which represents the relationship among predictor, mediator and criterion.

## 4. METHOD

### Sample:

Through the use of stratified questionnaires, the current study was carried out on 210 college students from Degree College Raibetawi (Jibar Province) in Iraq, all of whom were 100% between the ages of 18 and 28. This ensured a targeted representation of young adult learners in higher education. Individuals across cultural backgrounds.

### Instruments:

- **Gratitude Questionnaire:** Gratitude Questionnaire-6 (GQ-6; McCullough et al., 2002). The Gratitude Questionnaire-6 Item Form (GQ-6) is a widely used, brief self-report measure of dispositional gratitude. It assesses individual differences in the tendency to experience gratitude in daily life. The scale consists of six statements and respondents rate their agreement with each statement using a 7-point Likert scale. Cronbach's alpha value is 0.84.

- **Healthy Humility Inventory:** This 11-item Healthy Humility Inventory (Guinn, 2009) invites participants to rate their own qualities of healthy humility on a 6-point Likert scale. It mean score was determined using items ranging from 1 (not at all like me) to 6 (very much like me), with higher scores indicating higher levels of healthy humility (Cronbach's  $\alpha = 0.82$  at time 1). Among college students, this measure has shown strong psychometric qualities.
- **Meaning in Life Questionnaire:** Steger et al. (2006) created the Meaning in Life Questionnaire (MLQ). Two distinct structures make up the 10 items that make up the MLQ. Ten items associated with a seven-point Likert scale are used to measure each facet of this instrument. Higher scores indicate a greater presence of meaning and a greater desire for meaning; the scores range from 0 to 70. The goal of the meaning subscale has one question (item 8) that has reverse coding. Cronbach's alpha scores for both subscales in the normative sample ranged from 0.82 to 0.85. Among college students, this measure has shown strong psychometric qualities.

- **Mental Health Questionnaire:** Dugas and Singh's Mental Health Scale, which consists of 10 items. A five-point Likert scale is used to score the items: 1 means "strongly disagree," 2 means "moderately disagree," 3 means "neutral," 4 means "moderately agree," and 5 means "strongly agree." The dimension of psychological distress is used in reverse: (Items 1, 4, 11, 12, 13, 14, 15, and 16 have reverse scoring). We then summed everything. Strong internal consistency and other psychometric qualities are demonstrated by MHS (Cronbach's alpha of 0.92).

## 6. RESULTS AND DISCUSSION

### 6.1 Statistical Approach

All surveys were scored in accordance with national guidelines. SPSS 25 was used to assist in the data analysis. To maintain low humility and life meaning rates to the

prediction of mental health, a correlations study was conducted. To evaluate the hypotheses between gratitude, meaning, and internal variables, hierarchical regression analysis and mediation were also conducted using MEDIATE PROCSSIS. The computation of descriptive statistics, which are displayed in Table 1, is one of the statistics used in the inquiry. Features of the sample's demographics (n=210). There are 28.0% female and 71.4% male college students in National Life Products, Inc.

A rich framework for understanding psychological variables like Gratitude, Humility, meaning in life, and mental health is provided by the demographic variety in terms of geography, gender, socioeconomic class, and health status. Variables in these attributes give the study more external validity and enable subsequent comparisons in our inferential analysis. Table 2 displays the correlation coefficient, which was calculated using descriptive statistics.

Table 1. Demographic characteristics of sample (n=210)

S. No.	Demographic Variable	Number and Percentage
1.	Age (in years)	210 (100%)
	18-24	
2.	Gender	
	Male	71.4
	Female	28.1
3.	Area	
	Rural	35.7
	Semi-urban	20.7
	Urban	38.8
4.	Health	
	Poor	4.3
	Good	93.2
	Very good	47.0
	Excellent	31.0
5.	Income class	
	Lower	20.7
	Middle	58.8
	Upper	31.7

Table 2. Descriptive statistics and correlation coefficient between studied variables

	Mean	Standard deviation (SD)	1	2	3	4
Humility	41.25	13.10	-			
Gratitude	25.33	7.33	.422**	-		
Meaning in Life	43.96	11.44	.567**	.548**	-	
Mental health	55.33	11.58	.422**	.498**	.382**	-

\*\*p < .001, \*\*\*p < .001.

The Pearson correlation coefficients between the four main psychological variables in the study—mental health, gratitude, humility, and meaning in life—are shown in Table 2. In a sample of 210

college students, the analysis aids in understanding the direction and degree of correlations between these dimensions. To determine the link between the variables under study, the correlation coefficient was computed. Table 2 displayed the findings from the co-variance analysis. There was a substantial positive correlation between humility and gratitude (.403,  $p < 0.01$ ) as well as between humility and mental health (.425,  $p < 0.01$ ) and life meaning (.557,  $p < 0.01$ ). Table 2 also showed a significant correlation between gratitude and mental health (.498,  $p < 0.01$ ) and life meaning (.545,  $p < 0.01$ ). Likewise, there was a significant correlation between mental health and meaning in life (.398,  $p < 0.01$ ).

**Table 3. Model coefficient for the simple mediation model for humility, mental health and meaning in life**

Predictor Variable(s)	ML (Meaning in Life)			V (Mental Health)				
	B	SE	F	B	SE	F		
Humility (H <sub>1</sub> )	a	0.04	0.02	.000	c'	0.34	0.02	.000
Meaning in Life (ML)				b	0.21	0.07	.000	
Humility (H <sub>2</sub> )				c	0.43	0.07	.000	

Note. H<sub>1</sub> = H<sub>1</sub>(c); SE = standard error; B = unstandardized coefficient; H<sub>2</sub> = independent variable (humility); a = path a, the association between the independent variable (Humility) and mediator (meaning in life) or path a, the association between the mediator (meaning in life) and dependent variable (mental health); b = path b, the direct effect of the independent variable (humility) on the dependent variable (Mental health); c = path c, the total effect of the independent variable (humility) on the dependent variable (Mental health).

- Path a (H<sub>1</sub>—ML): The co-efficient B=0.04,  $p < 0.000$ , indicates a significant positive relationship between Humility and Meaning in Life. Higher Humility perceived higher meaning in life.
- Path b (ML—MH): The coefficient B=.21,  $p < 0.004$  shows a significant positive relationship between meaning in life and Mental health.
- Path c' (Direct Effect, H<sub>2</sub>—MH) controlling of ML: After accounting for meaning in life, the direct effect of H<sub>2</sub> on MH is B=.34,  $p < 0.000$ , which is positively significant.
- Path C (Total Effect, H<sub>1</sub>—MH): The total effect of H<sub>1</sub> on MH is B=.43,  $p < 0.000$ , indicating that H<sub>1</sub> positively impacts MH before considering the mediator.

**Table 4. Indirect effect of humility on mental health**

Predictor variable	B	SE	F	LLCI	ULCI
Humility (H <sub>1</sub> )	0.14	0.05	.000	0.03	0.25

Note. Unstandardized values, confidence interval of 95% lower limit of the interval (LLCI) and upper limit of the interval (ULCI).

**Table 5. Model coefficient for the simple mediation model for gratitude, meaning in life, and mental health**

Predictor Variable	ML (Meaning in Life)			V (Mental Health)				
	B	SE	F	B	SE	F		
Gratitude(G)	a	0.01	0.03	.000	c'	0.06	0.11	.000
Meaning in Life (ML)				b	0.17	0.07	.000	
Gratitude (G)				c	0.21	0.38	.000	

The Pearson correlation coefficients between the four main psychological variables in the study—mental health, gratitude, humility, and meaning in life—were shown in Table 2. In a sample of 210 college students, the analysis aids in understanding the direction and degree of correlations between these dimensions. To determine the link between the variables under study, the correlation coefficient was computed. Table 2 displayed the findings from the co-

variance analysis. There was a substantial positive correlation between humility and gratitude (.403,  $p < 0.01$ ) as well as between humility and mental health (.425,  $p < 0.01$ ) and life meaning (.557,  $p < 0.01$ ). Table 2 also showed a significant correlation between gratitude and mental health (.498,  $p < 0.01$ ) and meaning in life (.545,  $p < 0.01$ ). Likewise, there was a significant correlation between mental health and meaning in life (.398,  $p < 0.01$ ).

Table 6. Indirect effect of gratitude on mental health.

Mediator Variable	B	SE	P	LLCI	ULCI
Gratitude	0.15	0.06	.01	0.04	0.24

Note: Non-standardized beta, confidence interval of LL (lower limit) of the interval, UL (upper limit) of the interval.

### 6.3 Hypotheses and Path Coefficients

Table 7. Direct effects: regression path coefficients.

Hypothesis	Path	B	SE	p-value
H1	Gratitude → Mental Health (c)	0.32	0.11	.003
H2	Humility → Mental Health (c)	0.34	0.09	.001
H3	Gratitude → Meaning in Life (a)	0.25	0.03	.000
H4	Humility → Meaning in Life (a)	0.24	0.03	.001

#### Direct Effects (Table 7)

The regression analysis revealed several significant direct relationships between the studied psychological constructs:

**H1:** Gratitude also had a strong direct effect on Mental Health ( $B = 0.32$ ,  $SE = 0.11$ ,  $p < .001$ ), indicating that more grateful individuals tend to have better mental well-being.

**H2:** Humility significantly predicted Mental Health ( $B = 0.34$ ,  $SE = 0.09$ ,  $p < .001$ ), suggesting that individuals with higher humility reported better mental health outcomes.

**H3:** Gratitude strongly predicted Meaning in Life ( $B = 0.25$ ,  $SE = 0.03$ ,  $p < .001$ ), implying that grateful individuals tend to find greater meaning in their lives.

**H4:** Humility was positively associated with Meaning in Life ( $B = 0.24$ ,  $SE = 0.03$ ,  $p < .001$ ), suggesting that humility contributes to a deeper sense of purpose and significance.

Thus, the results provide robust evidence that both humility and gratitude influence mental health, not only directly but also through their contribution to meaning in life.

### 6.3 Indirect Effects / Mediation (Table 5)

**H5:** The indirect effect of gratitude on mental health via meaning in life was also significant ( $B$

$= 0.15$ ,  $SE = 0.06$ ,  $p < .001$ , 95% CI [0.04, 0.24]), confirming that meaning in life mediates the relationship between gratitude and mental health.

**H6:** The indirect effect of humility on mental health through meaning in life was significant ( $B = 0.14$ ,  $SE = 0.05$ ,  $p < .001$ , 95% CI [0.03, 0.25]). This supports the parallel mediation model, where meaning in life explains part of humility's impact on mental health.

The confidence intervals for both indirect effects do not include zero, further validating the significance of mediation.

The results provide compelling empirical evidence in favour of a mediated paradigm in which gratitude and humility have a direct and indirect positive impact on mental health through increased life meaning.

### 6.4 Discussion

A comprehensive mediation study ( $N = 210$ ) revealed that humility was a predictor of more life meaning ( $\beta = 0.04$ ,  $SE = 0.02$ ,  $p < .001$ ). Consequently, after adjusting for humility, meaning mediated increased mental health ( $\beta = 0.21$ ,  $SE = 0.07$ ,  $p < .001$ ). According to 5000 bias-accelerated bootstraps, the indirect impact was significant, with 40%  $\beta = 0.13$ , 95 percent CI [0.04, 0.23]. Humility continued to have a substantial direct impact on mental health ( $\beta = 0.34$ ,  $SE = 0.09$ ,  $p < .001$ ), suggesting serial mediation.

Table 8. Indirect effects: (Mediation analysis)

Hypothesis	Indirect Path	B	SE	p-value	95% CI (LLCI, ULCI)
H5	Gratitude → ML → MH	0.15	0.06	.001	[0.04, 0.24]
H6	Humility → ML → MH	0.14	0.05	.001	[0.03, 0.25]

According to these results, people with high levels of humility are more likely to believe that their lives have purpose, which improves their mental health by Chikudate et al. (2002).

Although a large part of the association may be explained by purpose in life, humility also directly predicts mental health outcomes, most likely through processes relating improved emotional regulation, healthier interpersonal interactions, and less self-focus. Therefore, cultivating humility may both directly and indirectly promote mental health, in part by strengthening a person's sense of purpose and coherence in life.

There was partial mediation of the statistically significant indirect impact of Gratitude on mental health through meaning in life (in  $d = 0.14$ ,  $SE = 0.04$ ,  $p < 0.001$ ). After controlling for the meaning, the direct impact of gratitude on mental health was still significant ( $\beta = 0.02$ ,  $SE = 0.01$ ,  $p < 0.001$ ), and the overall effect was substantial ( $d = 0.01$ ,  $SE = 0.005$ ,  $p < 0.001$ ). These results may be that the beneficial association between gratitude and mental health is partially mediated by meaning in life, thus supporting better mental health is a result of gratitude.

According to these results, those who are more grateful are more inclined to believe that their lives have purpose, which improves their mental health. The existence of a noteworthy indirect impact implies that this purpose serves as a key psychological mechanism via which gratitude operates, without, however, the substantial and noteworthy direct effect also suggests that gratitude has an independent impact on mental health, maybe via additional channels like better coping with better relationships, or better emotional control.

The current study's findings add to the existing corpus of research examining the psychological determinants of college students' mental health. The findings support the notion that mental health and its purpose are positively connected with both humility and meaning as by Lambert et al. (2012). A mediating function of meaning in life helps to explain how these personal qualities contribute to improved mental health outcomes. These results provide evidence to positive psychology theoretic frameworks that highlight the role of existential significance and virtue-based characteristics in promoting psychological well-being.

According to the mediator of meaning in life, people who feel grateful or excited are more likely to report feeling more purposeful, which improves their mental health. This provides the incorporation of meaning-oriented treatments into constructive mental health practices and emphasizes the importance of existential resources in mental health interventions.

## 6. CONCLUSION

This study comes to the conclusion that, both directly and indirectly through finding purpose in life, humility and Gratitude are strong, validated indicators of mental health. The results highlight the crucial role of gratitude character traits and a strong sense of meaning in life in order to improve young people's mental health. The research offers a greater knowledge of the psychological mechanisms connecting good qualities to mental well-being by demonstrating the mediating function of meaning in life.

## 7. LIMITATIONS

This work has many limitations despite its significant contributions.

1. First, causal inference is limited by the cross-sectional design.

To verify the directionality of the correlations between variables, longitudinal research is required.

2. Second, response biases might be introduced by depending too much on self-reported data.
3. Third, the results may not be as broadly applicable as they may be because the sample was restricted to college students in a particular demographic area.

## 8. FUTURE IMPLICATIONS

These connections between various demographics and cultural traditions may be investigated in future studies. The effectiveness of interventions designed to increase gratitude and humility in fostering a sense of purpose in life and benefiting mental health should be assessed. Furthermore, experimental and longitudinal research can support the establishment of causation and the long-term persistence of these psychological effects. The good development and mental health of young people might be greatly enhanced by creating

educational and counseling programs centered on fitness qualities and existential issues.

#### DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, Copilot, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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