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Volume 12

KVM. Prof. Dr. R. Ganesan

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Great Men are Never Born; they are Created through their Wise Teachers out of which Knowledge and Wisdom Emerges to Enlighten Millions in this World

- KVM. Prof. Dr. R. Ganesan

Foreword

The development of any nation is possible only through the overall contribution of intellectual resources. The enhancement of knowledge is the need for the hour, and it can be achieved by focusing on potential research and periodical innovation both in academia and industry. Moreover, these resources are very much required to bring about overall socio-economic development. Moreover, advancements in globalization depend on the outcome of holistic research conducted at various domains within academia.

The congregation of approaches towards theoretical perspectives and pragmatic inventions are quite indispensable to address the future challenges. In furtherance, this approach will facilitate enhancing the socio-economic sustenance and bring phenomenal growth within the global society. Keeping these aspects in view, this edited book has included selective book chapters in science, management, arts and humanities to support the integrated learning. In furtherance, 'NFED Publications' conveys to the publishing community that it is very much conscious and cautious about quality rather than quantity. The contributions made by each author are quite unique, as they adopt different scientific approaches in presenting their book chapters in this edited book.

I view this edited book, 'Holistic Research Perspectives – Vol.12' as one of the most significant resources in fostering impeccable information for knowledge enrichment.

I heartily appreciate the Chief Editor's conscientious efforts in organizing various authors from different states of India and compiling their research contributions in this edited book.

I am sure this edited book will enlighten the perspective of readers, researchers, academicians, and practitioners.

Sd/-

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Preface

The research studies across the globe have gained enormous significance in bringing the radical change in the society. Today, interdisciplinary and multidisciplinary researches are quite indispensable for holistic learning and attaining perpetual growth. A country's development depends mainly on nurturing the righteous knowledge potential, wherein impeccable research gains utmost importance. Moreover, the research avenues have to focus more on societal wellbeing, economic prosperity, and eco-friendly aspects. This is possible only through creating a plausible scientific base and encouraging budding researchers towards socio-technology innovations. In this context, intellectual capacity building becomes significant for achieving the overall socio-economic development.

This edited book titled 'Holistic Research Perspectives Vol.12' envisages in the mission of congregating the research chapters on science, management, arts and humanities for an effective socio-economic transformation. This edited book by itself is a learning platform, which brings in the required knowledge sharing among the research communities. It is to be noted that any scientific innovation is possible only through continuous research, which accounts for the inclusive growth. The results and observations discussed in the book chapters provides adequate research insights and exhibits new approaches to address the future challenges.

I sincerely thank all the chapter authors of this edited book for placing their genuine research contributions.

I am sure all the readers will benefit from this edited book.

Jai Hind!!!

Sd/-

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Abstract

In India, educational migration has been going on for a while and has accelerated recently. This study looks at how educational migration has changed over the past three decades (1991-2021). Using secondary datasets from the Census of India in 1991, 2001, 2011 and NSS 78th Round 2020-21, which employs descriptive statistical techniques along with graphical tools. A few studies on internal migration for education in India have been conducted. However, this field of inquiry is comparatively understudied in comparison to labour migration. Student migrants can be viewed as prospective labour market human capital. This is the rationale behind the study's goal, which is to investigate the fundamental elements of educational migration in India. It is evident that the number of educational migrants has increased significantly. The trends and patterns also exhibit anomalies across streams and geographical areas.

Keywords: India, Migration, Educational, Student, Internal, Facilities.

Introduction

According to the Census of India, educational migration refers to the movement of people from one place (village or town) to another for the reason of 'education'. The National Sample Survey Office (NSSO, 2023) provides information on persons who change their usual place of residence citing the reason of further 'studies' after staying at the place of residence continuously for six months or more. This type of migrants who have changed their last usual

place of residence for the purpose of education or pursuing further studies are considered as 'educational migrants' in this study. They can be also called 'student migrants' since all the participants are students by occupation.

Educational migration has been happening in India for a long time, although it constitutes a small share of the total internal migration in India. Education is always an indispensable reason of migration in population studies. That is why education was included as one of the five reasons of migration in the 1981 Census, when the Census of India started collecting information on reasons of migration during enumeration (Singh & Biradar, 2022). Educational migration as a phenomenon of population dynamics is an interesting and worthwhile area of study. It can be viewed in optimistic as well as pessimistic perspectives. For a student migrant, it is usually intended to get better education and skills. On the other hand, student migration can be considered as a sign of lack of access to good educational facilities at the places of origin (Dustmann & Glitz, 2011). Unlike the wide prevalence of research on labour/employment migration, there is a gap in research of educational migration in India except a few studies (Chandrasekhar & Sharma, 2014; Longkumer, 2015; Padhan, 2016, 2017 & 2023a; Kumar, 2020; Mistri, 2022, Mistri & Sardar, 2022; Singh et al., 2022; Bhattar, 2023). It is found that internal student migration receives less attention than international student migration, despite its sizeable volume and due significance from socio-economic and demographic perspectives (Mistri & Sardar, 2022). This study attempts to understand the gap by examining the trends and patterns of educational migration in the internal migration of India during the period 1991-2021.

Literature Review

Previous research studies have pointed out some information about certain aspects of educational migration in India. According to the Census 2011, over 5.5 million people had migrated for educational reasons, making up around 1.2 percent of all migrants in the nation. This indicates that approximately one out of every 100 migrants in India made the move for educational reasons. As per NSS report on migration, student migrants constitute 8 percent of all migrants in India varying from 8.9 percent in rural areas to 7.3 percent in urban areas (NSSO, 2023). This report also indicates that most of the educational migrants (67.80 percent) are out of labour force while the remaining is either employed or unemployed at the time of survey.

Most of the existing research analyses the educational migration data from various secondary sources as late as the Census 2011 and NSS 64th round (2007-08). Padhan (2016 & 2017) explores the demographic patterns and socio-economic determinants of educational migration in India based on NSS data ranging from 49th round (1992-93) to 64th round (2007-08). His work reveals higher occurrence of educational migration in short distances (intra-district – 37.20 percent inter-district – 45.60 percent) in 2007-08. The analysis indicated that migration has unquestionably enhanced access to higher education for low-income, rural and socially backward societies. There has been progress for those in higher socio-economic brackets but not for those in lower socio-economic categories. Chandrasekhar & Sharma (2014) also used the NSS 64th round data to study internal migration for education in relation with employment

migration in India. This study finds out that areas with more favourable employment prospects, like Delhi, Maharashtra, Gujarat, and Karnataka, whereas historically underdeveloped areas like Bihar, Uttar Pradesh, Orissa, and Rajasthan lose human capital.

Singh et al. (2022) presents an overview of internal student migration in India from the Census 2001, 2011 data and the NSS 64th round (2007-08) data supported by some primary data of field survey. Their work indicates that a more localized inter-district mobility has been found in migration of female students. The primary data showed that students' learning and placement experiences are harmed during the epidemic, and they also faced pressure to repay loans and lacked access to sufficient digital tools. Another study by Kumar (2020) discussed about the internal migration for higher education of India based on data of AISHE, 2011-12, 2014-15 and 1018-19. This study seeks to determine whether students' migration within India is driven solely by the desire to obtain educational credentials, or the migrants perceive it as a chance to live in a city and join the local labour pool. Moreover, his study revealed that student migration is a two-step process because migrant students see it as a chance to become part of the local workforce and live in a city after they graduate.

Some prior studies talk about either a particular stream of educational migration or a specific area of operation in this case. Shimray & Devi (2009) and Mistri & Sardar (2022) focused on migration of students from the Northeast region of India based on Census data of the period 1991-2011. These studies reflected on the changing trends and patterns of student migration regarding the concerned region of study. Moreover, there are research studies, which discussed about educational migration based on primary data collected from field survey. Longkumer (2015) research on different aspects of college student migration in the Northeast region by collecting primary data from Shillong, Meghalaya. Padhan (2023a & 2023b) explores the migrant students found in the NCR of Delhi with the help of field survey. Similarly, Bhattar (2023) gives qualitative insights on female student migrants based on samples from different states of India. This primary survey-based research provides deep insights about student migration which the macro level data cannot afford to give in detail.

Need & Relevance

Migration is one of the components of population dynamics besides fertility and mortality. So, migration data need to be updated from time to time due to its everchanging nature. While there has been no census enumeration conducted yet since the Census 2011, this study looks forward to other updated source of information for educational migration. This research hereby addresses the need of more recent information on trends and patterns of educational migration in India than the Census 2011. While studying all India phenomenon of educational migration, it is equally relevant to look for sub-national variations and anomalies. This study attempts to find out these variations. Moreover, student migrants can be considered as potential human capital for the future labour market. Hence, such research is relevant for the economic development too.

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Objectives

To study the evolving trends and demographic patterns of educational migration in the internal migration of India during the period 1991-2021

Methodology

This study uses descriptive statistical methods to conduct trend analysis and temporal patterns. Some statistical tools are described below:

1. Educational Migration Rate (EMR) $= \frac{Educational\ migrants}{Student\ Population}$ x 100

2. Decadal Growth Rate of Educational migration $= \frac{\{No.\ of\ Educational\ Migrants\ in\ N^{th}\ year\} - \{(No.\ of\ Educational\ Migrants\ in\ (N-10)^{th}\ year\}}{No.\ of\ Educational\ Migrants\ in\ N^{th}\ year}$ x 100

3. Sex Ratio of Educational Migrants $= \frac{Female\ Educational\ migrants}{Male\ Educational\ migrants}$ x 1000

In addition to that, the study employs IBM-SPSS version 26.0 software package for extraction, compilation and analysis of NSS sample dataset. It also makes use of ArcMap version 10.7.1 GIS software in making of choropleth maps showing spatial distribution and flow of migrants.

Data Sources

This study is entirely based on the following secondary datasets:

1. Migration tables (D-3), Census of India 1991, 2001 & 2011
2. Non-workers & Marginal workers tables (B-6 & B-10), Census 1991
3. Non-workers & Marginal workers tables (B-11, B-12 & B-13), Census of India 2001 & 2011
4. Multiple Indicator Survey (MIS) dataset, Schedule 5.1, National Sample Survey 78th round, 2020-21.

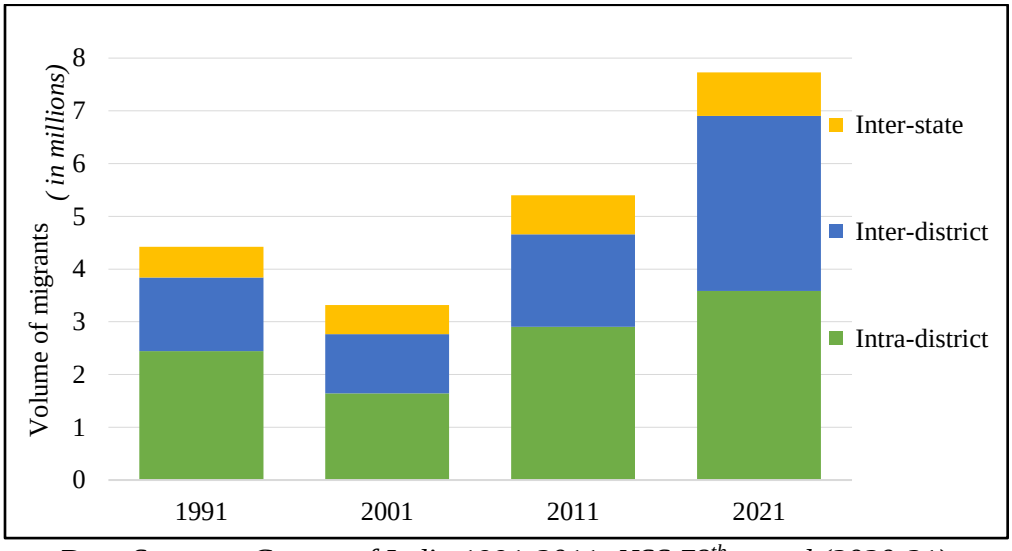
Only internal (domestic) migration is taken into consideration in this research. Foreign migration is more selective and not convenient to do analysis along with internal migration. The student population is used as the population in risk of educational migration. It is required to compute educational migration rate (EMR) for measurement of the prevalence of this migration across States/UTs within India. Student population data are extracted from the non-workers and marginal workers tables mentioned above.

Findings & Discussions

Actual volume of educational migration in India was 5.4 million migrants in 2011. It is estimated to be 7.7 million migrants in 2021. This whole volume of migrants can be segregated into different categories of distances moved. Under the purview of internal migration in India,

migrants may move within a district (intra-district migration) or across districts of a state (inter-district migration) or across states of India (inter-state migration).

Chart 1: India Educational Migration - Volume by Distance categories (1991-2021)



Data Sources: Census of India 1991-2011; NSS 78th round (2020-21).

It is found that most of the educational migrants move for short distances i.e., intra-district and inter-district categories whereas very few of them move over inter-state distance as shown in the Chart 1. Intra-state (intra-district & inter-district) migrants account for 86.20 percent in 2011 and 89.30 percent of total educational migrants in 2021. Even more than half of them confines their movement within the respective district boundaries as in 2011. This indicates the lack of access to better educational facilities in villages or towns of the student migrants (Chyrmang, 2010; Chandrasekhar & Sharma, 2014). Density of schools or colleges is relatively low in rural areas in India. As far as inter-state migration is concerned, students pursuing for higher education usually take part in this stream.

Prevalence of educational migration in India was 3.63 percent of student population in 2011 and 2.69 percent in 2021. This shows that there was an increasing trend of EMR during 2001-2011. It is also observed that there are variations of this migration rate across the States/UTs in India as shown in Chart 2. Mobility of students is comparatively low in the north and central Indian states such as Uttar Pradesh, Bihar, Jharkhand, West Bengal, Punjab, Haryana, Rajasthan, Gujarat, Madhya Pradesh, Chhattisgarh, Assam, Manipur and Tripura. Many of these states have low literacy and high poverty. They are facing problems of lack of development infrastructure including educational facilities (NITI Aayog, 2023). On the other hand, some south Indian states like Tamil Nadu, Karnataka, Andhra Pradesh, Telangana, Maharashtra, etc. have higher EMRs. Some of these states are favourable destinations of long-distance migrants as shown in Chart 6 and Chart 7.

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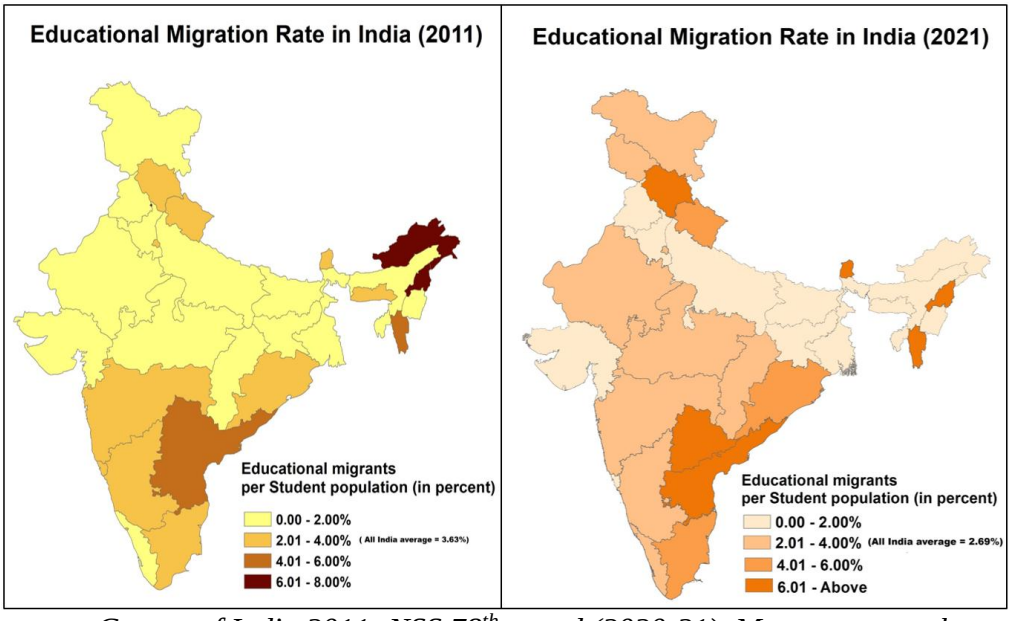
Chart 2: Prevalence of Educational migration in States/UTs of India



Data Sources: Census of India 2011; NSS 78th round (2020-21). Maps not to scale.

Higher mobility of students in hilly states like Arunachal Pradesh, Mizoram, Himachal Pradesh and Uttarakhand can be explained by that fact that their hilly topography restricts density of institutions and daily commutation, thereby encouraging the students to migrate more. States like Kerala and Manipur, in spite of having higher literacy, possess lower EMRs because the resident students do not have the need to migrate for better educational facilities.

Table 1: Decadal Growth Rate of Educational Migration in India

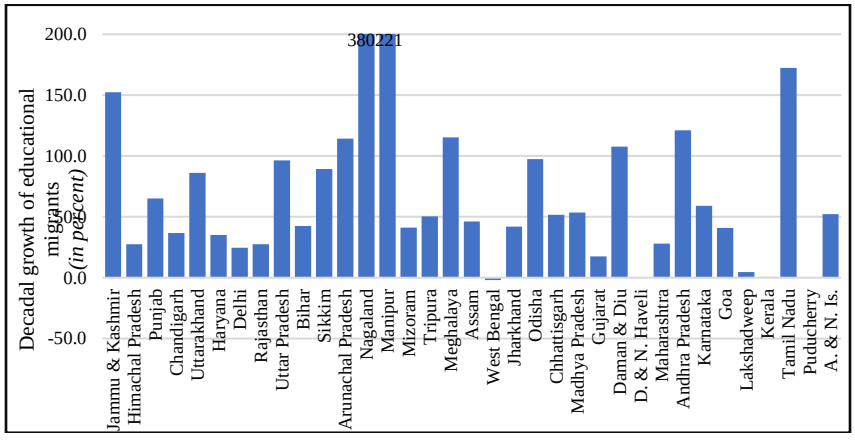
Period	Distance Categories		(Figures in Percentages)	
	Total	Intra-District	Inter-District	Inter-State
1991-2001	-24.90	-32.80	19.40	-5.00
2001-2011	62.80	77.20	55.20	35.40
2011-2021*	43.00	23.20	89.60	10.90

Data Sources: Census of India 1991-2011; NSS 78th round (2020-21)
** - Figures are estimates for the period*

For the period from 1991 to 2021, it can be fairly said that there is growth in educational migration in India. However, there were fluctuations in the growth trend (Table 1). During the decadal period 1991-2001, India has witnessed negative growth rate of -24.90 percent. It was partially or wholly affected by the economic liberalisation policies introduced in the 1990s, which subsequently improved access to educational facilities countrywide and reduced student migration (Nanzy, 2017). During the period 2001-2011, student migration has truly gained momentum in India with a decadal growth rate of 62.80 percent. In the following decade 2011-2021, this momentum has been slightly reduced to 43.00 percent. Among the states/UTs, the growth rate of educational migration varies quite a lot (as shown in Chart 3). States like Jammu

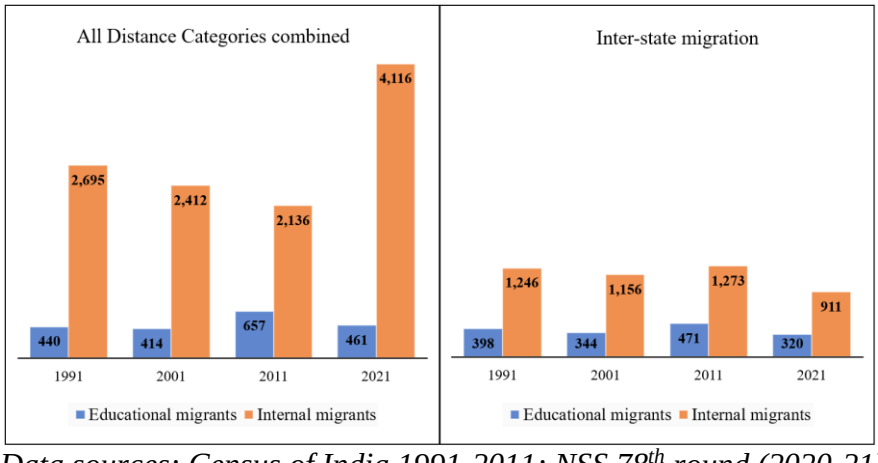
& Kashmir, Nagaland, Manipur, Meghalaya, Andhra Pradesh, Tamil Nadu, etc. have experienced more than 100 percent decadal growth rates during 2001-2011.

Chart 3: Growth of Educational Migration in States/UTs of India (2001-2011)



Data sources: Census of India 2001 & 2011

Chart 4: Sex Ratio of Educational migrants in India (1991-2021)



Data sources: Census of India 1991-2011; NSS 78th round (2020-21)

Sex ratio is a good measure of gender discrimination or selection in population studies. Similarly, in educational migration also, the sex ratio of educational migrants is found to be strongly unfavourable to female population (Chart-4). It should be kept in mind that female participation is more in case of all internal migrants combined due to contribution of marriage migration. However, in case of educational migration, there are only 657 females per 1000 male migrants in 2011 and 461 females per 1000 male migrants in 2021 in India. Gender selection is more acute if only inter-state migration for education is considered. These finding reflects the existence of gender gap in educational migration in India (Bhattar, 2023). The practice of son preference especially in rural areas often discourage girl students to pursue further studies leading to their early dropouts from schools or colleges (Mitra, 2014). Another

important factor for early drop-out of girls' students is poor condition of unavailability of separate girl/ladies' toilet in schools. Such early drop-out of girl students results into low sex ratio among educational migrants in India. Among the states, anomalies and wide gap are observed depending on the enthusiasm of respective state governments in formulating policies and implementation of girl child education. For example, Meghalaya known for its matrilineal society is recorded for the highest sex ratio of 1098 in 2011.

Table 2: Streams of Educational migration in India (1991-2021)

Years	Streams	Distance Categories (In Percentages)			
		Total	Intra-District	Inter-District	Inter-State
1991	Rural-Urban	38.00	36.00	42.00	38.00
	Urban-Urban	18.00	7.00	28.00	42.00
	Urban-Rural	6.00	4.00	7.00	7.00
	Rural-Rural	38.00	53.00	23.00	13.00
	Total	100.00	100.00	100.00	100.00
2001	Rural-Urban	38.00	37.00	42.00	34.00
	Urban-Urban	23.00	7.00	32.00	51.00
	Urban-Rural	6.00	5.00	8.00	7.00
	Rural-Rural	33.00	51.00	18.00	9.00
	Total	100.00	100.00	100.00	100.00
2011	Rural-Urban	34.00	34.00	36.00	32.00
	Urban-Urban	28.00	16.00	36.00	52.00
	Urban-Rural	6.00	5.00	9.00	7.00
	Rural-Rural	32.00	45.00	19.00	9.00
	Total	100.00	100.00	100.00	100.00
2021	Rural-Urban	20.00	14.00	27.00	37.00
	Urban-Urban	14.00	11.00	19.00	21.00
	Urban-Rural	9.00	6.00	10.00	22.00
	Rural-Rural	56.00	69.00	44.00	19.00
	Total	100.00	100.00	100.00	100.00

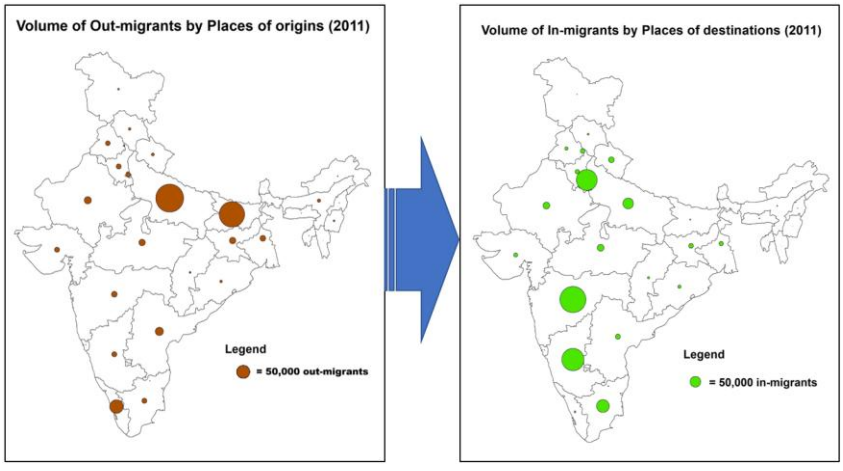
Data Sources: Census of India 2011; NSS 78th round (2020-21)

Migration for education can be observed through various streams between rural and urban terminals. Some migrants are found to be rural-bound (rural to rural and urban to rural areas) while some others are urban-bound (rural to urban and urban to urban areas) depending on level of education and distance covered. As laid down in Table 2, educational migrants in India are more rural-bound in short distance (especially intra-district) while are more urban-bound in long distance (inter-district and inter-state).

Inter-state migrants constitute 13.8 percent of all educational migrants in India as per Census 2011, which is about 7 lakh students. Since these migrants move from one state to another, they are considered as 'out-migrants' in the state of origin and at the same time, 'in-migrants' at the state of destination. A consistent flow of stream of migrants is developed between the

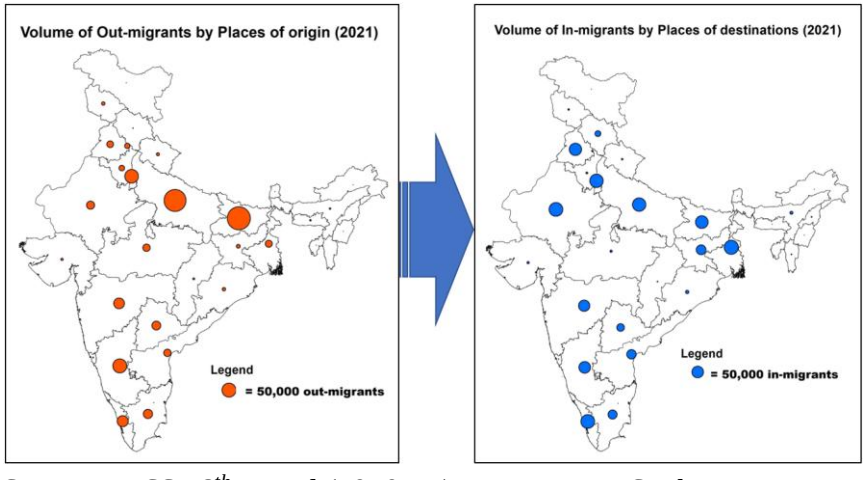
two terminals. As shown in Chart-5 and Chart-6, most of the migrants are concentrated in a few states. In 2011, about 33 percent of all educational out-migrants originated from Uttar Pradesh and Bihar alone, whereas 43 percent of all educational in-migrants was received by Delhi, Maharashtra and Karnataka. In 2021, in-migrants are found to be evenly distributed to more states like Delhi, Punjab, Rajasthan, West Bengal, Maharashtra, Karnataka and Kerala. These long-distance migrations are mostly in pursuance of higher and professional educational opportunities (Mistri, 2022; Mistri & Sardar, 2022). Hence, big cities in more developed states having state-of-the-art institutes like IITs and IIMs, other institutes of potential excellence and professional institutes are the favourable destinations of migrants (Chyrmang, 2010; Shimray & Devi, 2009; Kumar, 2020).

Chart-5: Distribution and Flow of Inter-State Educational Migrants in India (2011)



Data Sources: Census of India 2011. Maps not to Scale

Chart-6: Distribution and Flow of Inter-State Educational Migrants in India (2021)



Data Sources: NSS 78th round (2020-21). Maps not to Scale

Limitations

The present research faces certain limitations regarding the use of data sources. The NSS data source the year 2020-21 gives only sample estimates, which may not be adequate or quite reliable in the case of smaller States / Union Territories (UTs) and cross-sectional populations (NSSO, 2023). Hence, it is to be used with certain caution while interpreting the results of the analyses. In furtherance, it is also inconvenient to use this sample data in trend analysis like growth rate along with other previous censuses data. Nevertheless, this NSS data is taken into consideration in analysis for the sake of recent trends and patterns.

Suggestions

The study suggested that access to educational facilities especially school level should be increased so that students do not have to migrate on account of unavailability of facilities nearby. Moreover, gender discrimination against female students needs to be seriously addressed towards uplifting their participation in educational migration like their male counterparts equally. Also, policy initiatives like special scholarship for female student migrants may be introduced to encourage their participation and reduce the gender gap in student migration, which in turn will foster women empowerment at large.

Conclusion

The understanding from this research study is that if a student migrates in search of better educational opportunities, then it can be considered as a good venture for his/her future. However, if a student migrates due to lack of educational institute nearby, then it is a matter of concern to be seriously addressed by the government. The short distance migration for education, which is very common in India, and it could be due to lack of access to educational institutes. Also, very low sex ratio in educational migration is the precursor of low literacy rate in India. Furthermore, the sizeable volume of educational migrants occurring in rural-urban streams indicates the rural-urban disparities in educational development, which needs to be addressed by the concerned governments through adopting appropriate policies and measures.

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Challenges Encountered by Teachers in Managing Inclusive Classrooms in Pune, India

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Abstract

Inclusive education strives to integrate students with diverse abilities and needs into mainstream classrooms, and aims to foster equality, diversity, and a sense of belonging for all learners. Despite the legal and policy frameworks advocating for inclusion, the practical implementation of inclusive education remains a complex challenge for educators, particularly in resource-constrained environments. The present study investigates the challenges faced by teachers in managing inclusive classrooms in Pune, India, a city experiencing not only rapid educational growth but also confronting significant barriers to effective inclusion. Through qualitative interviews with 30 teachers from 10 schools (public & private) in Pune, the research identified several key challenges such as: insufficient teacher training in inclusive pedagogy, limited access to specialized teaching resources and assistive technologies, large class sizes that hinder personalized instruction, and a lack of systemic support from educational authorities. Additionally, societal attitudes and a prevailing stigma surrounding disabilities further exacerbate the difficulties teachers face in creating truly inclusive environments. The findings highlighted the pressing need for continuous professional development for teachers, improved resource allocation, and strategic policy reforms to create a more inclusive educational system in Pune. Thus, by addressing these aforesaid challenges, this study suggests that inclusive education can be more effectively implemented and needs to ensure equitable educational opportunities for all students.

Keywords: Inclusive Education, Teacher Challenges, Classroom Management, Teacher Training, Educational Resources.

Introduction

The aim of inclusive education is to integrate children with diverse learning needs into mainstream classrooms, including those with disabilities, and this has emerged as a global

educational priority. The rationale behind this is to foster equality, social justice, and respect for diversity, making sure that all the students receive equal access to quality education irrespective of their background or abilities. Globally, inclusive education framework aims to dismantle barriers that segregate students based on disabilities, cognitive impairments, or socio-economic status (Ainscow et al., 2006). Moreover, in India, inclusive education is regarded as a crucial part of the educational framework, which emphasizes the need for integrating children with special needs into mainstream schools. The "Right of Children to Free and Compulsory Education Act" (RTE, 2009) mandates that all the children must have access to free, inclusive, and equitable education within regular school settings, even the ones with disabilities. To support this, the Government of India has implemented policies and initiatives to ensure that disabled children shall receive education along with their non-disabled peers. However, the successful implementation of these policies continues to face substantial barriers, particularly at the classroom level (Sharma et al., 2015). Also, Pune is one of India's rapidly urbanizing cities, represents an educational microcosm where inclusive education is increasingly being prioritized. Despite the strong policy support, teachers in Pune's schools encounter numerous obstacles in managing inclusive classrooms effectively. These challenges arise from inadequate teacher preparation, limited resources, and a lack of systemic support, making it challenging to establish an environment where all students can succeed. The practical difficulties faced by educators in Pune reflect the broader issues encountered by teachers across India, where the implementation of inclusive education often fails to meet policy expectations. (Sharma et al., 2022).

This study aims to explore the challenges teachers face in managing inclusive classrooms in Pune, India. Through in-depth interviews with educators, it seeks to identify key barriers to effective implementation of inclusive education, including insufficient training, inadequate resources, and large class sizes. By examining teachers' experiences, the research aims to provide actionable insights into the obstacles they encounter and the strategies they employ to overcome them. Ultimately, the study aims to offer recommendations for enhancing teacher preparedness, improving classroom resources, and fostering a more supportive educational environment for both teachers and students in inclusive classrooms.

This research study will also emphasize the significance of teacher training and professional development as well as aspects that are often overlooked in discussions on inclusive education. Furthermore, by exploring the perspectives of teachers who are directly involved in inclusive practices, the study provides a grassroots-level understanding of how inclusive education policies are translated into practice. Additionally, the findings of this study will be valuable for policymakers, school administrators, educators, and other stakeholders striving for smooth integration of inclusive education in India. This research enhances the understanding of how inclusive education can be practically implemented in Indian classrooms, providing basis for future reforms that ensure quality education for all children.

Literature Review

Inclusive education goes beyond merely integrating the disabled students into regular classrooms; however, it is an extensive approach designed to foster an equitable learning

environment where all students, irrespective of their physical, cognitive, or social differences, can actively participate in the learning process together. This perspective emphasizes that an inclusive classroom should support the diversity of learners, ensuring their active participation, engagement, and access to high-quality education (Booth & Ainscow, 2002). Globally, educators have encountered a variety of challenges in implementing inclusive education effectively, many of which also resonate within the Indian context. These challenges encompass inadequate teacher training, scarce resources, overcrowded classrooms, negative perceptions of inclusive education, and lack of systemic support (Tiwari et al., 2015; Panda et al., 2023).

Global Challenges in Inclusive Education

Throughout the world, implementing inclusive education is often challenging, and has various obstacles such as inadequate teacher training and preparation. Most of the teachers express being unprepared to meet the diverse needs of students with disabilities, particularly in applying effective inclusive teaching strategies. A study by Forlin et al. (2009) found that limited expertise in training of inclusive practices contributes to teachers' experiencing frustration, burnout, and a sense of inadequacy. As a result, many educators continue to rely on traditional teaching methods that are not conducive to meeting the needs of all students. Furthermore, inadequate classroom resources such as specialized materials, assistive technologies and personnel support poses additional challenges to effective implementation of inclusive education. (Hegarty, 2000).

In many countries, large class sizes further aggravates this challenge, which makes it difficult for the teachers to provide individualized attention to students with special educational needs (SEN). Studies by Avramidis & Norwich (2002) highlighted that those large classes with diverse student needs place immense pressure on teachers, leading to ineffective implementation of inclusive teaching practices. Negative societal attitudes towards students with disabilities also contribute to the difficulties in managing inclusive classrooms. In numerous studies, teachers have reported a lack of understanding and acceptance of disability among peers and parents, creating additional barriers to inclusion (Tiwari et al., 2015; Panda et al., 2023). This societal stigma often influences the way teachers' approach the inclusion, which leads to resistance in integrating students with unique learning needs into regular classrooms.

Challenges in India

In India, the challenges of implementing inclusive education are magnified due to systemic, infrastructural, and cultural factors. While India has made significant advancements in supporting inclusive education through policy frameworks such as the "Right to Education Act (RTE, 2009)", these efforts have not always translated into effective classroom practices. Shrivastava & Sharma (2021) emphasized that inclusive education in India often remains a theoretical ideal rather than a practical reality, especially in schools that are under-resourced and lack trained personnel. Teacher preparation remains one of the most pressing issues. Teachers in India, particularly in rural and urban contexts such as Pune, often receive little to

no specialized training in managing classrooms with students with disabilities or those from marginalized backgrounds (Kumar & Banerji, 2024). The absence of specialized training poses a major challenge to effective inclusion, as teachers find it difficult to develop and apply teaching strategies that meet diverse learning needs.

A study by Hegarty & Alur (2002) found that while teachers generally had positive attitudes toward inclusive education, many of them felt unprepared to address the diverse learning needs of the students within a single classroom. In India, teachers are often required to manage large student populations with diversified abilities, including children with disabilities, learning difficulties, and gifted students. Another significant barrier in India is the insufficient availability of learning resources and support staff. Also, their study highlighted that many schools, particularly in underfunded regions, lack the necessary materials and assistive devices to support students with disabilities. Moreover, lack of teaching assistants or special education professional places full responsibility on teachers to handle the demands of diverse learners on their own, making the task overwhelming. Consequently, teachers in Indian schools often resort to a 'one-size-fits-all' approach, which is not effective in promoting an inclusive learning environment. (Sharma et al., 2015).

Context of Pune

Pune, an educational hub in India, serves as an important case study for exploring the challenges of inclusive education in urban settings. While Pune has several schools, both public and private, that are committed to inclusive education, these institutions still face numerous difficulties in implementing inclusive practices. Additionally, a considerable gap exists in awareness and understanding of inclusive education among the stakeholders, including teachers, parents, and administrators in Pune. This disparity between different types of schools further exacerbates the difficulties in implementing inclusive education on a large scale in Pune.

Strategies to Overcome Challenges

Although the challenges of inclusive education are considerable, several studies suggest strategies for overcoming these barriers. Firstly, teacher training programs must be improved to in order to equip the educators with necessary skills and knowledge to effectively manage diverse classrooms. A study by Sanjeev (2007) emphasized the importance of professional development programs focused on inclusive pedagogy, disability awareness and classroom management strategies in preparing teachers to create an inclusive learning environment. Additionally, fostering collaboration between general education and special education teachers can help students with disabilities to receive the support they require (Forlin et al., 2009).

Secondly, enhancing resource availability is vital for successfully implementing inclusive education. Equipping teachers with assistive technologies, differentiated teaching materials, and access to support staff can significantly improve the learning experience for all students. Research has shown that schools with well-developed support systems, such as teaching assistants or resource rooms, are more effective in addressing the diverse needs of their

students. (Hegarty, 2013). Finally, addressing negative attitudes towards disability through awareness campaigns, both within schools and the wider community, can help shift perceptions of inclusion and foster a more supportive environment for all learners (Hegarty & Alur, 2002).

Need & Significance

The literature review revealed that inclusive education, while a globally recognized goal, faces numerous challenges in implementation. In India, and specifically in Pune, the challenges of inclusive education are worsened by 'inadequate teacher training, limited resources, large class sizes, and lack of systemic support'. However, with targeted teacher preparation, proper resource allocation, and shift in attitude, implementing inclusive education successfully is possible. The findings from this review highlight the necessity of continuous research in this area and subsequent policy reforms to overcome these barriers and to ensure that all the children have access to quality education equally irrespective of their diverse abilities. Understanding the specific challenges faced by teachers in Pune is essential for advancing inclusive education in urban Indian setting. Furthermore, insights from literature review emphasize the need for this study, which aims to promote a more 'inclusive education system' that benefits all students despite their varied abilities and background. The significance of this study also lies in its potential to bridge the gap between inclusive education policy and its practical implementation in India. While the legal and policy frameworks in India, such as the 'RTE Act (2009)', which advocates for inclusive education, the gap between policy intent and classroom reality remains wide. This study offers an in-depth understanding of the practical issues faced by teachers, whose experiences have often been overlooked in academic discourse and policy planning. By focusing on Pune, a growing educational hub in India, the study adds value by offering insights into the context of urban schools, where unique challenges related to infrastructure, resource availability, and diversity in student needs often emerge.

Objective

To understand the challenges encountered by teachers in managing inclusive classrooms in Pune, India

Methodology

This section outlines detailed steps taken during the research process, including the sampling procedure, sample size, inclusion & exclusion criteria, research design, data collection (techniques, interview process and recording & transcription), and data analysis procedures in order to systematically explore the difficulties teachers face to manage inclusive classrooms in Pune, India.

Sampling Procedure

The sample comprises of teachers working in inclusive classrooms in various schools within Pune at India from both government and private schools respectively. Purposive sampling technique has been used to ensure that the sample would provide rich and relevant information

in accordance with the subject of study. This technique allowed the researcher to select participants who are directly involved in inclusive education, ensuring that their experiences and insights would contribute meaningfully to the research.

Sample Size

The study included 30 teachers (15 each from government schools and private schools) who were actively involved in inclusive classrooms. This sample size has been considered adequate for qualitative research, as it provided a range of perspectives from both public and private school settings. Moreover, it allowed for data saturation, which means that no new themes or insights emerged from the interviews as more participants have been included.

Inclusion Criteria

The following criteria are used to select participants for the study:

- Participants had to be currently teaching in an inclusive classroom setting, either in a government or private school.
- Teachers must have had at least one year of experience working with students with disabilities in an inclusive setting.
- Participation was voluntary, and teachers were required to provide informed consent before taking part in the study.

Exclusion Criteria

The following teachers are excluded from the study:

- Teachers who did not have direct experience working with students with disabilities.
- Teachers who were involved in special education classes that were separate from the regular classroom setting (i.e., teachers not working in inclusive environments).
- Teachers who did not have sufficient experience in managing inclusive classrooms (less than one year of experience).

Research Design

The study adopted a qualitative research design to explore the experiences, perspectives, and challenges of teachers managing inclusive classrooms. This approach is appropriate because it allows for in-depth understanding of complex issues, such as teacher preparedness, resource availability, and classroom dynamics, which are not easily quantifiable.

The qualitative data provides insights into the real-life experiences of educators working in the field of inclusive education. Hence, keeping in view the nature of the study, descriptive research method has been adopted in a specific geographical (Pune, India) and socio-cultural context. This method is quite ideal for a detailed understanding on how these challenges are perceived by teachers and its impact on effective inclusive education in the study area.

Data Collection

A. Techniques

The data has been collected through semi-structured interviews, chosen for flexibility in allowing in-depth exploration of key topics, enabling the researcher to probe deeper into issues raised by the participants while maintaining a structured set of questions.

B. Interview Process

- **Development of Interview Guide**: An interview guide has been developed based on the literature review and identified research gaps. It included open-ended questions aimed at exploring teachers' experiences, perceptions, and challenges in managing inclusive classrooms.

- **Interview Procedure**: The interviews have been conducted in a private and quiet space within each school to maintain confidentiality and minimize distractions. Each interview session lasted approximately 45-60 minutes after informing the teachers about the study's purpose and obtaining their consent. With the participants' consent, all the interviews are audio-recorded, and detailed notes have been taken to capture the nuances of the conversation.

C. Recording & Transcription

- The audio-recorded interviews are transcribed verbatim by the researcher. This ensured that all data are captured accurately for analysis.

- Each interview is assigned a code to maintain the anonymity of responses by the participants. For instance, Teacher 1 (T1) for the first participant, Teacher 2 (T2) for the second, and so on.

Data Analysis

The data gathered from the interviews have been analyzed using thematic analysis, which is a widely recognized qualitative research method that emphasizes identifying and interpreting patterns within the data. The present study adopted the following data analysis procedures:

A. Familiarization with Data

- The initial step involved is to repeatedly review the transcribed interviews to familiarize with the data and identify initial impressions.
- The researcher also made notes on the key themes and patterns that seemed to emerge from the data during the familiarization stage.

B. Generating Initial Codes

- In this phase, the researchers coded the data by highlighting significant statements and segments of text that are relevant to meet the research objective.
- Open coding is used, which involved labelling data without any predefined categories. This helped to keep the analysis open to unexpected themes.

C. Searching for Themes

- The researchers then grouped the initial codes into broader categories or themes that reflected recurring patterns across the interviews.
- Themes are developed based on the key challenges identified by the teachers, such as lack of teacher training, inadequate resources, and large class sizes.

D. Reviewing Themes

- After developing the initial themes, the researchers reviewed them to ensure that they accurately represented the data and are coherent in their interpretation.
- Some themes are merged, refined, or further broken down based on the data, ensuring that they fully captured the experiences of the teachers.

E. Defining & Naming Themes

- The final stage involved defining each theme clearly and naming them to capture the essence of the experiences and challenges described by the teachers. For instance, a theme like ‘Teacher Preparedness’ captured the lack of training, while ‘Resource Gaps’ referred to insufficient teaching materials and support.

F. Interpretation of Data

- Once the themes are finalized, the researcher interpreted the findings in relation to the literature review, highlighting how the identified challenges in Pune align with or differ from global trends in inclusive education.

G. Ethical Considerations

Ethical guidelines are adhered throughout the research process to uphold the study’s integrity and safeguard the rights of participants. The ethical considerations are outlined below:

- **Informed Consent**: Participants were thoroughly informed about the study's purpose and gave their written consent before taking part.

- **Confidentiality**: All participant data were kept confidential, with any identifying information removed or anonymized.

- **Voluntary Participation**: Participation was entirely voluntary, and teachers had the freedom to withdraw from the study at any time without any consequences.

The aforesaid methodology followed a systematic approach that combined purposive sampling, semi-structured interviews, and thematic analysis to explore the challenges faced by teachers in managing inclusive classrooms in Pune. This detailed procedure enabled the researchers to collect rich, qualitative data and generate meaningful insights that can inform policies and practices in inclusive education.

Results

The results of this study revealed that several key challenges the teachers faced when managing inclusive classrooms in Pune, India. The identified challenges are primarily related to a lack of teacher training, inadequate resources & support, large class sizes, lack of parental involvement, and societal attitudes toward disabilities. Moreover, the challenges are discussed in detail along with relevant quotes and data visualizations wherever applicable are highlighted below:

Lack of Teacher Training

A significant challenge reported by teachers is lack of adequate training in inclusive education. Many teachers revealed that they have never received formal training in special education or inclusive teaching strategies. The limited exposure to training workshops led to feelings of inadequacy and lack of preparedness to teach students with disabilities effectively. The distribution of teachers' formal training has been highlighted in Chart 1.

Key Findings

- **No Formal Training**: A large proportion of teachers have reported that never having received training specific to inclusive education.

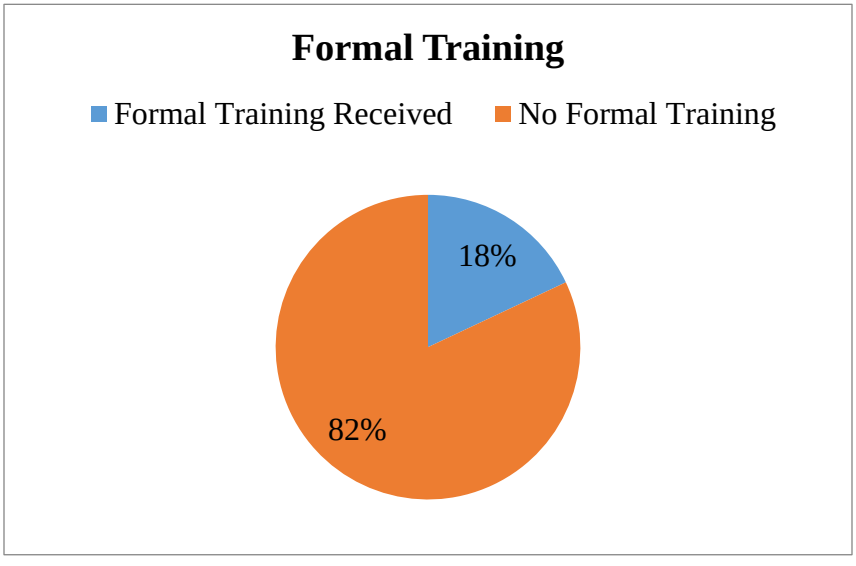
- **Short Workshops**: Teachers noted that workshops provided by schools are brief and quite insufficient for equipping them with the necessary skills.

- **Emotional Impact**: Teachers have expressed feelings of anxiety and a lack of confidence due to inadequate preparation.

- **Teachers' Testimonial**: The teachers mentioned that they are never trained on how to handle children with special needs. 'We only get a brief workshop, but that is not enough. There is so much, whereas we do not know about working with children who have autism or visual impairments.'

The following pie chart shows the proportion of teachers who have received formal training in inclusive education versus those who have not.

Chart 1: Distribution of Respondents in accordance with Teachers' Formal Training



Inadequate Resources & Support

The lack of proper resources has been reported as another major challenge identified by teachers. Many schools lacked the necessary teaching aids, 'Braille books, hearing devices, and assistive technologies', which are crucial for providing an inclusive education. In addition to this, the teachers have reported insufficient specialized staff (such as teaching assistants or special educators), which further complicated the task of supporting students with disabilities. The distribution of teachers' reporting in accordance with inadequate sources & support alongside managing large class sizes has been highlighted in Chart 2.

Key Findings

- **Lack of Assistive Technologies**: Schools did not provide enough tools such as Braille books or hearing devices for students with disabilities.

- **Insufficient Support Staff**: Teachers have reported on shortage of specialized personnel to assist in classrooms with diverse learners.

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- **Teachers' Testimonial**: The teachers have responded that they have no proper materials to help the students with visual or hearing impairments. 'We try our best, but it is quite difficult without the right resources. It feels like we are not equipped to provide equal learning opportunities to all kinds of students.'

Large Class Sizes

A significant barrier to inclusive education identified by the teachers is the large class sizes. Teachers have reported that large numbers of students, often ranging from 40 to 50 per class, made it challenging to provide individualized attention to students with disabilities. The large classes also created further difficulties with classroom management, as students often became distracted or disruptive.

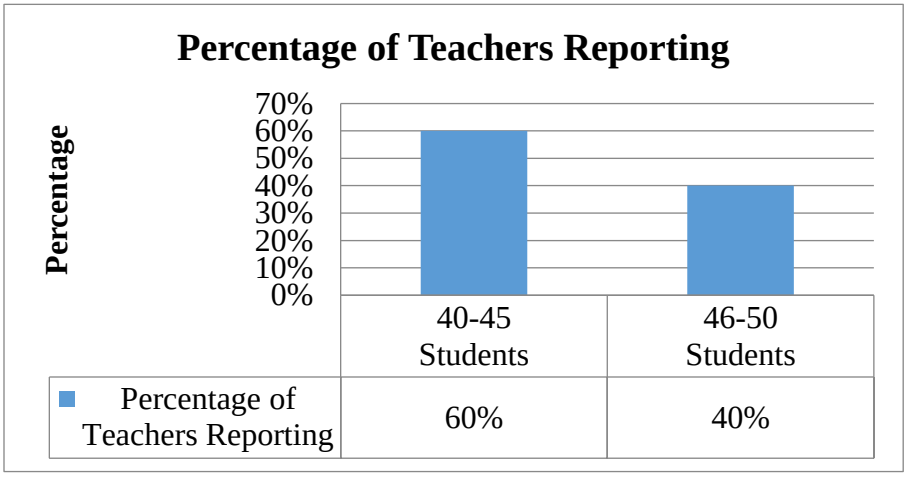
Key Findings

- **High Student-To-Teacher Ratio**: Class sizes of 40-50 students made it challenging to give special attention to students with disabilities.

- **Classroom Management Issues**: Large classes led to distractions, making it harder for teachers to manage diverse leaning needs of the students.

- **Teachers' Testimonial:** 'When you have so many students in one class, it is hard to focus on the needs of children with disabilities. They often get lost in the crowd, and we do not have the time to address their individual needs.'

Chart 2: Distribution of Respondents in accordance with Teachers' Reporting



Lack of Parental Involvement

Teachers have highlighted the absence of parental involvement as a significant challenge. Many parents, particularly in lower-income communities, are not fully aware of their children's rights to an inclusive education or the role they could play in supporting their children's learning at home. This lack of partnership made it more difficult for teachers to create a supportive and inclusive environment for students with disabilities.

Key Findings

- **Limited Parental Understanding**: Many parents were unaware of inclusive education frameworks and their children's rights.

- **Minimal Support at Home**: Some parents were not actively involved in supporting their children's learning, which negatively impacted the effectiveness of inclusive practices.

- **Teachers' Testimonial**: 'Some parents do not understand the importance of inclusive education. They always do not support what we are trying to do in the classroom, and this lack of partnership makes it even harder to support these children.'

Societal Attitudes & Stigma

Teachers reported that societal attitudes towards disabilities continue to be a major barrier to effective inclusion. There remains a significant amount of stigma associated with disabilities, which negatively affects the interactions between students with disabilities and their typically developing peers. This stigma also influences how teachers view their role in creating inclusive environments.

Key Findings

- **Stigmatization of students with disabilities**: Teachers observed that students with disabilities were often treated as different by their peers, which hindered their inclusion.

- **Impact of societal attitudes**: Negative societal attitudes contributed to a lack of true inclusion, as students with disabilities were sometimes marginalized.

- **Teachers' Testimonial**: 'There is still a lot of stigmas around disabilities. Children with disabilities are often seen as different, and it affects how other children interact with them. This can create challenges in creating a truly inclusive environment.'

Summary of Results

The results summary presented in Table 1 provides primary challenges faced by teachers in managing inclusive classrooms.

Table 1: Summary of Challenges Encountered by Teachers

Challenges	Frequency of Mentioning	Percentage of Teachers
Lack of Teacher Training	20	82.00
Inadequate Resources	18	75.00
Large Class Sizes	16	70.00
Lack of Parental Involvement	14	60.00
Societal Attitudes & Stigma	12	50.00

Table 1 highlights significant barriers to effective 'inclusive education' in Pune, which are lack of teacher training, inadequate resources, and large class sizes. Other challenges, such as lack of parental involvement and societal stigma, also contribute to the difficulties teachers face in creating inclusive environments.

Discussion

The results of this study underscore the complex and multifaceted challenges that teachers in face in managing inclusive classrooms, which are consistent with findings from global research on inclusive education. The key barriers identified through data analysis includes the lack of teacher training, inadequate resources, large class sizes, insufficient parental involvement, and the negative impact of societal attitudes towards disabilities. Furthermore, each of these challenges influences the ability of teachers to effectively implement inclusive education practices and provide a truly inclusive learning environment for all students.

A. Lack of Teacher Training

The inadequate training of teachers is a major barrier to effective inclusive education in Pune. This aligns with the findings of Hegarty & Alur (2002), who noted that while teachers may express a positive attitude toward inclusive education, many feel unprepared to manage diverse classrooms due to insufficient professional training. Teachers in Pune reported a general lack of specialized knowledge and skills in special education, which made it difficult to effectively teach students with disabilities. Despite some workshops and training sessions, these efforts were often short-term and insufficient for long-term impact. Kumar & Banerji (2024) also highlighted this issue in his research, noting that training programs on special education are often not comprehensive enough to address the wide variety of needs that teachers encounter in inclusive classrooms.

B. Inadequate Resources & Support

The shortage of learning resources and support systems is another significant barrier. Teachers have reported that their classrooms lacked essential tools such as assistive technologies, Braille books, and specialized equipment that could help students with disabilities. This shortage of resources has been consistently reported in studies by Sharma et al. (2022), who emphasized the importance of providing schools with adequate materials to create a truly inclusive

environment. In Pune, the issue is exacerbated by the lack of specialized staff, such as special educators and teaching assistants, who can provide targeted support to students with disabilities. This resource gap places additional pressure on regular teachers, who may already be struggling with large class sizes and the need to support a diverse student population.

C. Large Class Sizes

The issue of large class sizes has been identified as another major challenge that teachers in Pune are undergoing. With student-to-teacher ratios often reaching 40 to 50 students per class, teachers are unable to provide the individualized attention required to support students with disabilities effectively. This issue is compounded by the fact that many teachers must manage the educational needs of a wide range of students with varying levels of ability, further stretching their capacity to deliver high-quality instruction to all learners. Similar findings are reported by Shrivastava & Sharma (2021), wherein they have pointed out that large class sizes undermine the principles of inclusive education, as it becomes challenging to meet unique requirements of every student.

D. Lack of Parental Involvement

Parental involvement is a key factor in inclusive education, yet the study revealed that many parents are either unaware of their children's rights or not actively participating in their learning support. This lack of involvement not only limits the effectiveness of inclusive education practices but also contributes to the social isolation of children with disabilities. Research by Hegarty & Alur (2002) also highlighted the importance of parental engagement in fostering a supportive learning environment for children with disabilities. In Pune, many parents, especially in lower-income communities, lack awareness about inclusive education, making it difficult for teachers to create a partnership with parents for improving the learning needs of students with disabilities.

E. Societal Attitudes & Stigma

Societal attitudes towards disabilities continue to pose a significant barrier towards successfully implementing inclusive education. Teachers in Pune have reported that there is still considerable stigma surrounding disabilities, which affects both the students and teachers. This stigma can lead to negative perceptions of students with disabilities, reducing their opportunities for social integration and academic success. This finding is consistent with the study conducted by Hegarty & Alur (2002), which reported that negative attitudes toward disabilities contribute to the marginalization of students with special needs, even in inclusive classrooms. In Pune, societal attitudes have a significant impact on how students with disabilities are treated by their peers, and this affects their ability to fully participate in classroom activities.

Limitations

While the study provided valuable insights into the difficulties encountered by teachers in managing inclusive classrooms in Pune, it has been subjected to few limitations that are indicated below:

- **Geographical Scope**: The entire study has been conducted only in Pune, wherein the findings cannot be generalized to other regions within India.

- **Sample Size**: Although 30 teachers provided a range of perspectives, a larger sample size could potentially provide more comprehensive view of the challenges faced by teachers across different schools.

- **Potential Bias**: Teacher self-reports can be subject to potential bias, especially when discussing sensitive issues such as the lack of training or resources.

Recommendations

Based on the findings of this study, various recommendations are put forward to address the challenges that teachers face in managing inclusive classrooms in Pune. These suggestions are designed to enhance overall effectiveness of inclusive education in the city.

Teacher Training: Mandatory and continuous professional development programs should be implemented for teachers, focusing on inclusive education strategies, special education techniques, and classroom management skills for diverse learners. Training should be inculcated through hands-on experience and designed to equip teachers with the knowledge and confidence they need to manage classrooms with students with disabilities effectively.

Resource Allocation: For inclusive education to be effective, schools must have necessary resources, such as assistive technologies, teaching materials, and specialized staff. This includes offering Braille books, hearing devices, and other essential tools to meet the needs of students with disabilities.

In furtherance, the schools should hire specialized staff, such as special educators or teaching assistants, to provide additional support in classrooms with diverse learners.

Reducing Class Sizes: Efforts should be made to reduce the student-to-teacher ratio in classrooms, particularly in inclusive classrooms, to allow for more individualized attention for students with disabilities. Smaller class sizes would enable teachers to focus more on meeting the specific needs of each student, which is crucial for effective inclusion.

Parental Involvement: Schools should build strong collaboration with parents and keep them informed about inclusive education practices and actively engage in supporting their child's learning. Parent-teacher workshops, information sessions, and regular communication can help build awareness and encourage active participation from parents in the educational process.

Awareness Campaigns: There is a need for wider societal awareness campaigns to reduce stigma and promote a more inclusive attitude towards people with disabilities. These campaigns should be directed at both educators and the general public to promote a more inclusive and supportive environment for students with disabilities.

Conclusion

The present research study highlighted the significant challenges faced by teachers in managing inclusive classrooms in Pune, India. The implementation of inclusive education effectively has significant challenges, which includes inadequate teacher training, limited resources, large class sizes, and societal stigma surrounding disabilities. These barriers align with existing research on inclusive education and highlight the urgent need to address them in order to foster equitable learning environment. This study emphasizes the necessity of substantial reforms to effectively implement inclusive education in Pune's schools, and ensures that all students receive quality education irrespective of their diverse abilities. By tackling these issues and implementing the recommended measures, Pune can make meaningful progress towards building an inclusive education system that benefits all learners. Such efforts will not only enhance the educational experiences of students with disabilities but also contribute to a more inclusive and progressive society.

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A Conceptual Study on Pulses Value Chain Practices in India through Case Overview Towards Understanding its Impact on Improving Neuro Nerve Disorder

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Abstract

The food processing firm expands its business globally and integrates with other firms based on a sustainable global food value chain, which creates a huge advantage to increase international trade and raise the import and export of food products, which directly increases the global GDP. The major focus of food processing companies is on sequences of tangible and intangible value-adding activities, from demand, conception, production, and supply of processed food to end-use. The concept of a sustainable food value Chain can be traced to some work on the commodity chain. The basic idea was to set up inputs and make a transformation into processed food that leads to fulfilling the future market requirement of consumers and establishing the desirable link of the food process. The pulse processing industry has played a significant role in India's economy because of the way pulses are consumed and produced in the country. It is required to develop the possible backward links that could uplift the farmers who are living in marginalized environments. The study describes the growth and development of Indian pulse processing industries with pulse value chain practices focusing on the process of a sustainable food value chain that enhances the pulse production process discusses the benefit of pulses in several health diseases, and shows the importance of pulses in medical treatment. The study develops the conceptual structure of the Indian pulses value chain and describes the significance that could lead to growth and opportunity for pulses industries.

Keywords: Processed, Requirement, Transformation, Marginalized, Significance.

Introduction

Pulse processing could enhance the incomes of firm owners, farmers, and other intermediaries and support the pulse value chain practices that played key roles in achieving long-term goals and profits. India is the largest pulses producer, consumer, and importer of pulses in the world, which made a direct impact on the economy that caused increases in the export and import of pulses in other developed and developing countries. Pulses contribute about 20 percent of the

area in India that is covered under food grains and presently produce around 7-10 percent of pulses production in India (Malo & Hore, 2020). The food processing firm expands its business globally and integrates with other firms based on a sustainable pulses value chain, which creates a huge advantage to increase international trade, which increases the import and export of food products and increases the GDP of the country. The major focus of food processing companies is on sequences of tangible and intangible value-adding activities starting from the demand, conception, production, and supply of processed food to end-use. The concept of pulse value chains can be traced to some work on the commodity chains (Bain, 2010). The basic idea was to set input and make the transformation that led to fulfilling the future requirements of consumer ability and establishing desirable links of the process. The pulse processing industry has the potential to play a significant role in India's economy because of the way pulses are consumed and produced in the country. It is required to develop the possible backward links that could uplift farmers who are living in marginalized environments. Pulse processing could also enhance the incomes of firm owners, farmers, and other intermediaries in their pulse value chain, and these actors could become key performers in achieving the long-term goal. The study analyzes the importance of pulse value chain practices in India, which significantly increase pulse production and also reduce the constraints in pulse production. The present study describes the conceptual framework model of pulse value chains adopted in India and discusses the case study of pulse value chains. The pulse value chain has coordinated the farmers, suppliers, and local mandis, which made a direct impact on the economy and increased the export of value-added pulse-based food products. This research study focuses on the adoption of sustainable supply chain management networks and value chain practices in firms, which have supported to achieve the estimated demand for the future pulse-based product.

Literature review

The literature review discusses the importance of pulse production and enhanced the pulse firms that promoted the sustainable food value chain, which directly increases the value addition practices and strengthens the supply chain management system of firms. The developed countries have now become the main exporters of pulses that promote the pulses trade, which made a direct impact on the demand for pulses (Joshi & Saxena, 2002). India has been a global leader in pulse production and consumption and an importer of pulses over the decade also introduced the innovative advanced methodology of pulses processing that promotes the adoption of sustainability practices (Singh et al., 2015). The sustainable pulses value chain developed the relationship with agriculture food safety to generate quality standards, which established the mapping of pulses value chain entities with agriculture food safety and increased the supply of pulses commodities (Gereiffi, 1994). The pulse value chain practices achieved the sustainability parameters of economic, environmental, and social factors of the sustainability dimension (Sellahewa & Martindale, 2010). The sustainable supply chain developed the framework structure, which involves different innovative techniques and consists of sustainability performance indicators to develop the design strategies, which offer opportunities to measure the sustainability performance of pulse processing (Bloemhof et al., 2015). The aforesaid literature review has provided the insights regarding pulse production and pulse value chain practices and shows the importance of pulses in neuro disorder diseases.

Need & Relevance

The global value chain increases the strengths and weaknesses of manufacturing firms, which will increase the probability of exports and imports, and also provides benefits to small firms involved in downstream channels (Giovannetti & Marvasi, 2016). The assessment criteria of the food value chain are based on geographical distance, supply chain length, size of firm structure, and governance method of local and global food chains (Bloemhof et al., 2015). Also, a research study analysed the food value chain, which made direct interventions in the food system, to provide information on consumer choice of the food chain (Schmitt et al., 2018). The different approaches of sustainable pulses and value chain practices have developed the sustainable benchmarking, performance indicators, which includes the data collector, developed the transformation using rescaling, and determined importance of sustainable pulses value chain, and proposed methodology which quantifies the data with expert opinion and constructs the sustainability index, wherein the sustainability dimension has been more effective than sustainability risk mitigation strategies for reducing risk in the supply chain (Schmitt et al., 2018). Also, a study conducted by Sahu and Arora (2022) mentioned that pulses firms in the Uttar Pradesh, Rajasthan and Delhi NCR are facing a critical situation and in the declining phase. Hence, there is a need to know the pulses value chain practices in India through case overview towards understanding its impact on improving neuro nerve disorder.

Objectives

- To study the pulses value chain practices and develop the conceptual framework structure of the pulses value chain
- To study the importance of pulses in the medical treatment of Neuro disorder and discuss their medical benefits

Methodology

The primary data has been collected from food processing firms of selected locations from different states of India viz. Uttar Pradesh, Rajasthan, and Delhi / NCR out of which 26 pulse firms are selected to generate information related to the adoption of sustainable pulses value chain practices and their satisfaction and dissatisfaction related to government policy, taxes, etc. are taken into consideration and conceptually observed by the researcher and are discussed accordingly. The secondary data comprises of statistical information and other relevant inputs, which are collected from the Ministry of Food Processing Industries (MOFPI) India, which is an authentic database source of the food industry. The other secondary data are collected from reports, authentic databases, food industry reports, journals, and internet sources. The present study adopted descriptive research method to provide an in-depth knowledge regarding the value chain of pulses and provide the benefits of sustainability in pulse production.

Pulse Production

Pulses are an essential food grain in the food eco-system of human beings. Globally, it is considered a high source of protein and is responsible for providing high-yield capacity. Also,

pulses are more protein-enriched by weight, which is more than twice the amount of rice and wheat. Pulses generate an important vegetative protein diet with high biological value and is enriched to pulse provides the integral component of a sustainable pulse production system and generates the pulses with the ability to mix with biological nitrogen fixation with soil that improves the yield capacity, and is required only with low water requirement. The pulses have the quality to be produced in abnormal weather conditions and India is considered as the largest producer of pulses in the world. Pulses production reached about 25 percent of pulse production and covered 35 percent of the global area for pulse production (Ahlwat et al., 2016).

Pulses production suffered from both biotic and abiotic diseases. For reducing those diseases, the most widely used methodology – participatory rural appraisal (PRA) method is applied to prioritize the challenges and issues to identify the cause of low production (Ali et al., 2012; Reddy, 2009). Consequently, a large gap occurred between the demand and supply of pulses. It is required to take the necessary steps to improve the condition of pulse production and maintain the balance between the demand and supply of pulses (Singh et al., 2015). Global pulse production generates several objectives of pulses by increasing its production through area expansion and adoption of innovative techniques that enhance pulses. Also, several programs are introduced to improve the condition of pulses production.

Pulses are considered an important constituent of protein and are applied in the human diet to provide necessary protein important food. Pulses provide a rich source of protein and make the perfect mix of vegetarian protein with high biological nutrients. Nutritional security by agricultural scientists and planners are focusing on a highly integrated farming system, which could help the farmers at the time of farming pulse crops by utilizing new innovative and hybrid pulse seeds and crop rotation practices with regard to pulses cultivation. Pulses supplemented the cereals, which generates the perfect mix of a more vegetarian protein diet. Pulse production in India is comparatively lesser than in developed countries such as USA, Canada, Myanmar, etc. The reason being pulses are mainly grown in different rainfed regions and tropical climates.

The global pulses production reached near about 73.2 million tons. In India, most of the states suffer from pulse production due to poor yield capability and poor per-hectare pulse production grown on irrigated fertile land due to uncertain climate conditions, which are more unstable. The growing population of India generates the high-pressure demand for pulses, which helps to maintain the supply of pulses and also to control the prices of pulses. It is to be noted that the increased global demand for pulses with rising pulse consumption is driving the Indian pulses market to adopt sustainable innovative practices that improve the pulse-based sustainable global value chain, which gives more value-added pulses processed food (Joshi & Saxena, 2002). The pulses production in India for the last five years (2019 - 2023) are indicated in Table 1.

Table 1

Years	Production in Lakh Tons
2019-20	230.25
2020-21	254.63
2021-22	273.02
2022-23	275.04

Source: Ministry of Agriculture & Farmer Welfare, Government of India

Indian Pulse Processing Industry

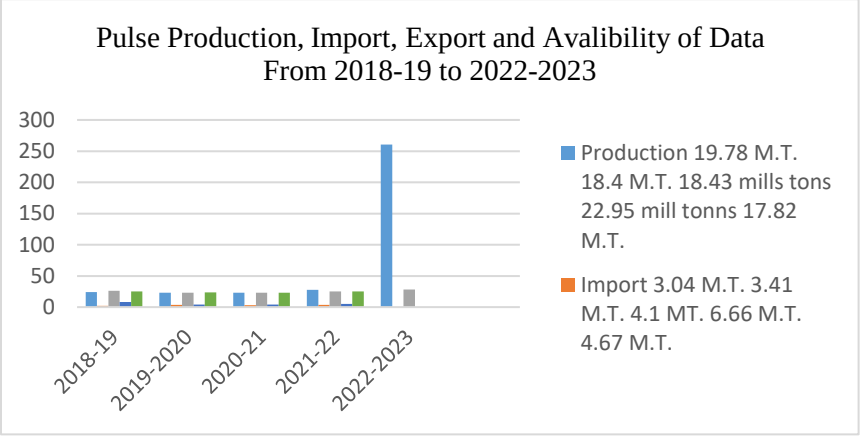
India is the largest pulses producer, processor, and consumer and has emerged as the largest importer of pulses in the world. India imported more than 6.6 million tons in the year 2015. Country pulse production was proven insufficient to supply the rising demand of the rising population, which required more pulse commodities in the market. The Indian pulse requirement has been estimated near about 32 million tons of import in the year 2030. This implies that India would increase pulse production, and made expansion of pulse processed firms, and also promote sustainable pulse value chain practices to fulfill the widening gap of demand and supply, research and development of the country. The total pulse production that occurred during 2021-22 is recorded at 27.75 million tonnes which will double in the next year of pulses production by 260.58 million tonnes, which shows that India has become self-sufficient in pulses production and involved in exports and imports of pulses in large tonnes to other developed and developing countries. Indian pulses production followed the preceding seven years of pulses, trade, and consumption, which are available in tabular form below. Table 2 illustrates the status of pulse production, import, availability, export, and domestic availability of pulses from the preceding ten years.

Table 2

Pulses	Years									
	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Production	19.78 MT	18.4 MT	18.43 MT	22.95 MT	17.82 MT	24.02 MT	23.02 MT	23.05 MT	27.75 MT	260.58 MT
Import	3.04 MT	3.41 MT	4.1 MT	6.66 MT	4.67 MT	2.23 MT	3.58 MT	3.00 MT	3.41 MT	2.9 MT
Total Availability	22.82 MT	21.81 MT	22.53 MT	22.49 MT	22.49 MT	26.25 MT	23.01 MT	23.05 MT	25.05 MT	28.33 MT
Export	0.34 MT	0.23 MT	0.19 MT	0.27 MT	0.27 MT	8.26 MT	4.10 MT	4.10 MT	5.10 MT	54 MT
Domestic Availability	22.48 MT	21.58 MT	22.34 MT	22.22 MT	22.22 MT	25.19 MT	23.50 MT	23.05 MT	25.05 MT	2.9 MT

Source: Directorate of Economics and Statistics (DES), Department of Agriculture & Cooperation (DAC) and Department of Commerce (DoC), Economic Times, India Times, 2021

The given table illustrates the status of pulse production, import, availability, export, and domestic availability of pulses from the preceding seven years.



The given bar chart describes the status of pulse production, availability, import, and export of pulses in India, from the years 2018-19 to 2022-2023, which showed the highest pulse production as compared to the last four years of pulse production. In the year 2021-22, very few imports of pulses were made, and the export of pulses will increase every four years. The bar chart describes the pulse production status for a total of five years.

Benefits of Pulses in Neuro System

Pulses are considered to be beans, peas, lentils, etc., which are highly consumed in the Indian diet. Also recognized is the rich source of protein diet, which generates numerous benefits to human health. A wide variety of protein is grown in different countries globally, which has become more economical and is extensively used as food in the world. Pulses provide the protein fibers that are more important to develop the Nero fibers system in the human brain and provide a rich source of iron zinc, folic, and magnesium to the neuro system from pulses seeds and beans, also increasing the protein intake in the human diet. Pulse consumption develops the serum lipid profile, which reduces cardiovascular diseases and makes the balanced serum lipid profiles, which reduces the risk of heart failure and improves blood pressure, platelet formation, and inflammation (Mudryj et al., 2014). Protein is an important constituent of the Indian diet. The major importance of protein is developing numerous neuro fibers that support the neuro system. The protein generated from pulses, which generates the protein efficiency ratio and is required for a weight gain measurement, also releases the protein digestibility acids control lipid profile ratio, an indispensable ratio to generate the protein requirement in the human body. Plant-based protein is available in the form of pulses and is a rich source of protein and minerals required for the benefit of human health. Pulses develop the nervous system through fiber quality, which enriches and helps to cover the area with muscle fibers as compared to animal sources of protein. Also, it generates more risk related to cardiovascular diseases, heart attack, and developed high cholesterol levels. Moreover, reducing those diseases plant plant-based proteins are required to control all cardiovascular diseases and improved the nerve disorders through different medicine made up of pulses,

which helps to improve the nervous system (Nosworthy et al., 2023). The pulses provide the protein constituent that helps to stimulate neuronal activity in the structure of human brain and develop the nerves for a continuous supply of blood. It increases the blood flow in the human brain and pulses are used as medical treatment for various diseases. Also, it helps to reduce the formation of tissue and gently provides electrical pulse fibers, shape the neural system and increase the efficiency in terms of both activation of neural activity (Hofmann et al., 2011). The Fig 1 shows the constituent of pulses protein that directly impacts the human health system.

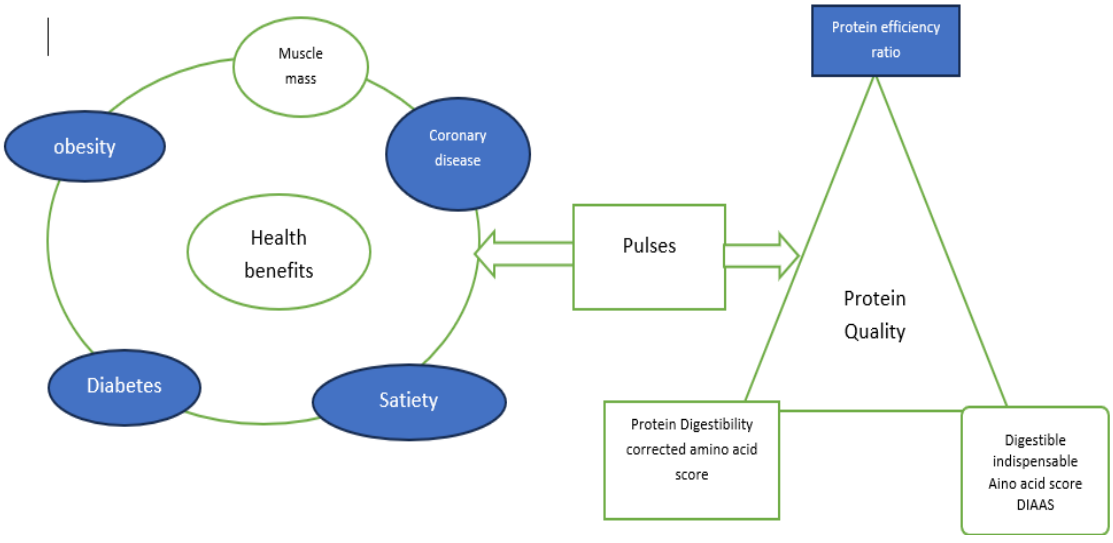


Fig 1

Source: Plant Proteins: Methods of Quality Assessment and the Human Health Benefits of Pulses (Nosworthy et.al., 2023)

Fig 1 defines the various diseases that affect human health are reduced and controlled through pulses used in medicine and human diet, is also considered the rich source of pulses plant protein fibers, and protein quality, which made a direct impact on protein digestibility amino acid and protein efficiency ratio, protein indispensable amino acid, etc. This has improved the human health and reduced the risk of heart failure, nerve break down, also increases the protein of intake and made development of the structure of neuro disorder.

Pulse is an essential ingredient of the human diet that generates the health consciousness in people to maintain themselves fit. Pulses are gluten-free, are a rich source of nutrients, and generate a large amount of energy in the human body. Pulses are incredibly rich in nutritional content and decrease the level of fats and cholesterol in the body. Pulses are rich in Proteins, essential amino acids, fiber, carbohydrates, antioxidants like polyphenols, folate, and iron, and minerals such as calcium, zinc, magnesium, potassium, etc., making regular consumption of pulses lower the risk of heart disease by 10-20 percent. Pulses have a low glycemic index, making them beneficial for blood sugar control and diabetes management. Sources such as

pulses are rich in antioxidants, which help to protect against chronic diseases like cancer and heart attack, never break down neuro diseases, etc. (Mudryj et al., 2014).

Pulses developed brain stimulation, which is a medical treatment to cure brain-opted diseases with the required conditions. This treatment stimulates several nerves in the brain and helps to vibrate and make reactions in different conditions, which includes essential tremor, Parkinson's disease, conditions, and obsessive-compulsive disorder (OCD) that requires brain stimulation, which can be easily performed with the pulses that helps to generate fibers and also improve the nervous system.

Pulse Value Chain

The concept of the value chain was introduced by Michael Porter and includes the various activities that bring the product or service from the initial phase to consumption (Sah et al., 2024). A pulse value chain performs the processing activity related to different business functions from specific input related to the particular product formation, performs the transformation into a marketing-based product, and final sale of a particular product (GIZ, 2007). The pulses value chain includes several intermediaries that perform different functions such as producers, processors, and traders, and distribution of particular products, adopted the linked with a channel through which the product passes through the several distribution networks to several intermediaries to end consumers. The pulse value chain consists of several actors performing different functions, such as movement of material, information, procurement, and maintaining logistics and value addition of services to end consumers (Singh et al., 2018).

The pulses value chain achieves the objectives of competitiveness, inclusiveness, sustainability, scalability, and access to finance, which promote the growth and opportunity of pulses firms. Thus, the pulses value chain performed the movement of materials, information, and services and shared an interest in the end product analyzed for advanced techniques (Singh et al., 2018). The pulses value chain builds strong linkages between exporters and smallholder manufacturers to develop an efficient pulses value chain, where the demand and supply of pulses are communicated to producers and the inputs of raw pulses are available to ensure proper pulses production to provide the necessary export of pulses. The consistent supply of pulses between producers and exporters provides several provisions of regional-specific input packages and made the development of new varieties of processed pulse food. At present pulses, value chain scenarios are rarely adopted by farmers because of a lack of quality, lack of technology, pulses have faced a higher market for costly input or a supplier of cheaper raw materials for pulses production, and it is very necessary that both ends of the supply chain the proper adoption of pulses value chain is required in agriculture which becomes more profitable to industries and performed the monetary flow from rural to urban areas. A research study reported that high fluctuation of market with regard to pulse prices, poor quality of raw pulses production, lack of supply chain network, limited distribution of pulse food product, lack of technology, and unavailability of skilled labour are the significant causes of failure of pulses firm in the Indian context especially in Uttar Pradesh, Rajasthan and Delhi NCR (Sahu & Arora, 2022). The Fig 2 illustrates the conceptual model of the Indian pulse value chain.

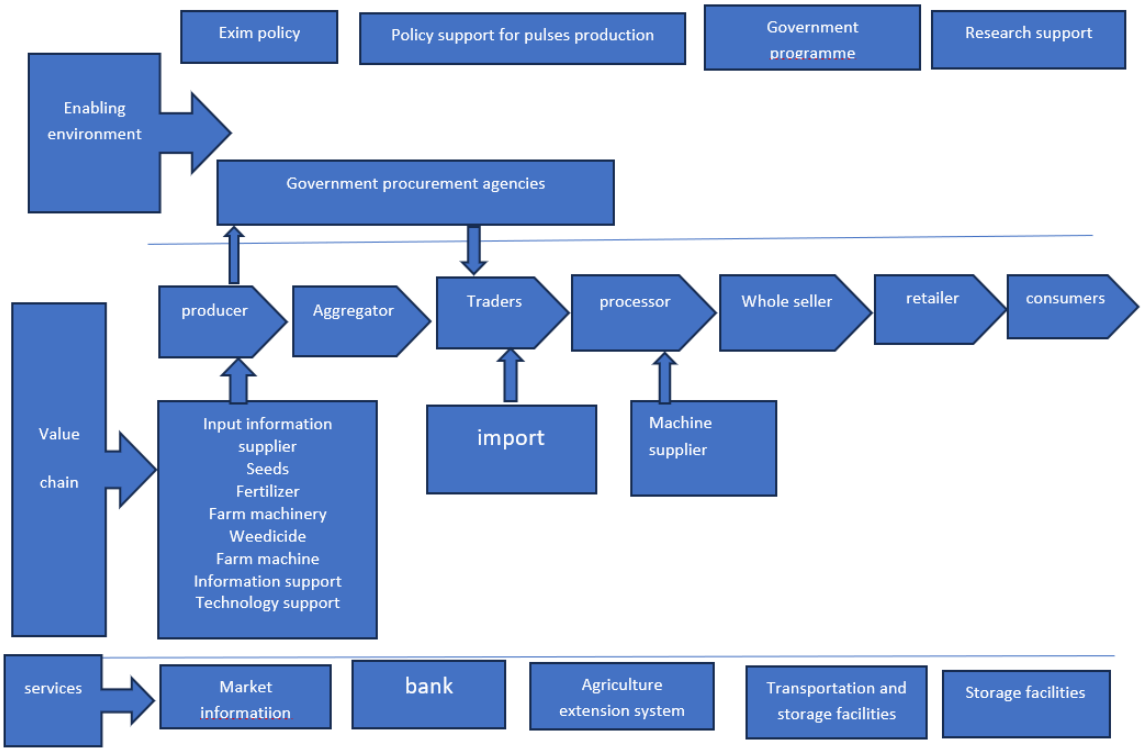


Fig 2

Source: Pulse Value Chains in India - Challenges and Prospects: A Review, Sah et al., 2024

The Fig 2 defines the diagrammatic presentation of the pulses value chain of India. The pulses value chain consists of primary processing, supply chain process, and secondary process with enabling factors. The value chain is made of the direct link to the supply chain process of pulses e.g. pulses value chain made a direct link with the input process which is part of the producer and then reaches to aggregator, trader processor, and reaches to final consumer for consumption. Similarly, the service sector enabled with the market information, sales, agriculture extension system, transportation storage facilities and developed the upper part of consist of enabling environment, which made a direct link to examine policy, strategies policy support for pulses production and government program. The value chain practices enhance primary and secondary processing to provide value-added pulse products.

Case Overview of Pulses Value Chain Practices in India and Ethiopia

Overview – Case I

The case study was conducted in India in the state of Bhagalpur district. It adopted the stratified random sampling method and considered the farmers and stakeholders as respondents. The primary data collected from 20 wholesalers, 10 retailers, 5 village traders, and 50 farmers were adopted for the improved pulses production technology to understand the value chain activities. The analysis of data related to cost, pulses, and transportation costs involved with cultivation techniques that are considered in pulses value chain activities. Moreover, analyzing the

farmer's farming method, whether using new mechanism or old to define how much farmers adopted the value chain practices in the initial ground, through study we determine that a large number of farmers have adopted the advanced methods of farming and cultivation techniques such as improved seed, fertilizers, and pesticides has involved the other transportation, processing, and distribution to the whole seller to consumer, in Bhagalpur district. Many farmers and mill owners have adopted the pulse value chain practices of enhancing economic channels or pulse value chains, which directly impacted the income level of rural producers and stakeholders. In Bihar, pulse production adopted the framework structure of pulse value chain, which serves two purposes: providing the processed pulses through intermediaries via pulse value chain and developing the policy for improving the situation of pulse production and promoting the rural development of planners with the respective pulses market. Pulse production adopted crop rotation practices, which gives an equal chance to improve the production of grain and pulses and emphasizes the adoption of crop rotation practices.

The pulses value chain increases the income of 90 percent of farmers who sell their produce to large intermediaries, such as village traders, wholesalers, sellers, and retailers to consumers. This could help the flow of pulses from large mill and processing companies and adopt the value addition practices, which received 50 percent of pulse production and reduced the pulses share, also causing higher market margins. Therefore, the supply chain network of pulses is required to adopt the betterment of backward linkages which consist of suppliers and farmers also improving the forward linkages of pulses processors, and pulse growers with the market to analyze the revenue generation from pulses production The sustainability dimension are environment, social and economic factors are implemented in advanced method of value chain practices and pulses production that supports the government policies to improve the efficiency of the pulses market in Bihar, also identify the major challenges such as less number of processing firms, lack of technology, lack of resources, and lack of market information which reduced the capacity of pulses production and processing, and identify the major constraints are lack of processing mil, inadequate quality seeds faced by the farmers in the selected district of Bihar (Singh et al., 2018).

Overview – Case II

In Ethiopia, the pulses value chain practices were initially adopted by farmers to increase the production of pulses and generate income, also supporting domestic and international markets. In Ethiopia, Pulses play a vital role in Ethiopia's food security and raise the economy. Pulse production is estimated at 2.5 million metric tons in 2016 and 2017 (Jun- Jul), which promoted exports during that period that reached up to 340,000 metric tons, to generate $255 million in forex (Attaché Report, 2018). The pulse value chain practices have adopted the benefit as increased input for farming and processing to build the yield gap between current and future market demand to provide the knowledge and conduct awareness programs of pulse value chain activities in Ethiopia, that improved the linkage between exporter and producers established linkages with exporter with the farmer to get maximum benefit and generate incomes. It also provides an adequate market according to the needs of the current generation and maintains the demand and supply of pulses. The pulse value chain in Ethiopia generates transparency to enhance farming practices, adoption of new technology, and improve seed to

give maximum pulse production. Ethiopian Pulse's value chain provides year-round transactions that support the supply chain distribution of domestic and international markets, which has made a direct impact on Government of Ethiopia and development partner strategies.

The Ethiopian pulses value chain is more focused on increasing inputs to improve the production of pulses and generate access to inputs to build the yield gap between current and potential pulse production. In Ethiopia, the pulse value chain practices provide the following ingredients to improve the pulse's quality and provide important minerals such as Phosphates and other fertilizers which improve the pulse production and supply to farmers and also provide necessary information for improving the pulse's quality. The Ethiopian pulse value chain is important. Pulse breeding should expand and provide the leverage for a variety of seeds and development. The extension of value chain practices incorporates the pulses production, similarly, the country is more inclined to develop the linkages between exporters and producers which gives a more efficient value chain where inputs are available to ensure proper promotion of the necessary export pulses and make the development of new varieties of processed pulses for export and allowed the leverage of cooperatives to provide consistent input supply of pulses and provides the processed pulses offtake. In Ethiopia, the pulses value chain provides the adequate pulse market to increase the exporters and makes market transparency, quality, and aggregation for exports the responsibility of the pulses value chain to track both domestic and international markets, to strengthen the export of pulses. Developing the Ethiopian pulse value chain will increase foreign reserve earnings and create a steady demand pull for pulses. The pulses value chain in Ethiopia supported the business environment, which became more conducive to investment and developing the policies to generate the knowledge base (Yirga et al., 2010).

Observation

The study analyses the preceding five years of pulse production and determines the current status of pulse production. Table 3 shows the pulse production in India from 2013-14 to 2022-2023.

Table 3

Year									
2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
19.78 MT	18.4 MT	18.43 MT	22.95 MT	17.82 MT	24.02 MT	23.02 MT	23.05 MT	27.75 MT	260.58 MT

Table 3 shows the pulse production continuously increased, and this shows that small farmers and stakeholders adopted several advanced technologies and participatory rural appraisal methods, which identified the major challenges. It also introduced the risk mitigation strategy for reducing those challenges to give maximum pulse production of up to 260.58 million tonnes. Which promotes the export and import of pulses to other developing and developed

countries. At the same time, it generates the importance of the pulses value chain practices in pulses firms as well as in farmers for increasing the quality of pulses and providing more value-added pulses food products. The study analyzes the importance of pulses in the human body through different studies it identifies that pulses are applied as medicine in several chronic diseases and reduce the risk of heart failure and risk of nerve disorders, it improves the formation of brain structure and develop the stimulation in nerves of neuro system, it also helps to control cholesterol-related heart diseases, the pulses generates several health benefits which improve the human body and considered as medicine in medical treatment.

Discussion

The present research shows the current status of food processing firms and how companies are adopting pulses value chain practices, enhancement of the pulses sector, and improvements in supply chain management. The study provides in-depth information related to pulse production and identifies the major constraints in pulse production that occurred during pulse production. Moreover, this research generates the growth prospects that occurred during the rise of pulse production and determines the growth status of the Indian pulse processing industry. Also, from the past decade to the present, pulse production growth has been very high, which could upgrade the export and raise the high consumption of pulse processed food. The study showed the significance of pulse value chain practices that could increase the value-addition practices of pulse firms and generate information and processing techniques with the help of the conceptual framework structure of the food value chain structure. Moreover, the pulses value chain provides the benefit of the movement of material, information, and service to develop the interest in the end product effect both collectively and made simultaneously (Singh et al., 2018).

The growth and development of the food industry support small farmers, key stakeholders, and mill owners in raising income and generating profits. The food processing techniques are based on secondary processing of food. Therefore, the processing firms require suitable plants and machines with sustainable practices and measurement techniques to generate the processed food. This study reveals the long-term advantages and benefits for firms to develop the pulses market as well as maintain the demand and supply of pulses and focus on supply chain management. The pulses value chain practices increase the value addition practices in food processing to provide more nutritious and quality food in hand. Furthermore, sustainable practices in the food value chain provided the opportunity for the growth of pulses trade and their market, the community-supported agriculture, from farms to institutions to generate incomes and achieve sustainable pulses production (Pinard et al., 2014).

Pulses provide enormous benefits related to human health, Pulses develop fibers in the human body to develop the nervous system and prevent nerve breakdown and cardiovascular diseases. They help to stimulate the organs and release protein-digestible amino acids, which prevent several diseases. The present study generates various significance related to pulse products and pulse value chain practices. The growing population generates a high demand for pulses as a diet and nutritional substitute; at the same time, pulses are largely required for medical treatment for making various medicines to control the heart and other chronic diseases. The

need for study generates a high demand for pulses to improve neuro diseases and generate the nerve system and formation of the structure of the brain. It helps to stimulate neuroactivity in the human brain and provides protein to every part of the body. The high demand for pulses shows it has become a large substitute of animal protein, and is easily available to every generation of people. The significance of pulse value chain practices in manufacturing firms in India are as follows:

a. In India, the pulses value chain improved the firm's production capacity, achieved financial stability, and introduced products in national and international pulses markets. The pulses value chain increases the access of inputs to improve productivity and establish a bridge between various intermediaries to fill the yield gap between current and potential pulse production, also promote crop rotation practices, and maintain the demand and supply of adequate pulses as per the requirement of exporters.

b. In India, the pulses value chain improved linkages among exporters and producers that generate a more efficient pulses value chain approach to forecast the potential demand according to market requirements and ensure proper production to generate the necessary export of pulses. The pulses value chain enables the consistent supply of producers and exporters, which includes the provision of specific input packages and the development of new varieties for export.

c. In India, pulses value chain developed market transparency, quality, and aggregation for exports (Yirga et al., 2010), which is more productive and stable, to generate the year-round transactions that maintain the demand of domestic and international markets also made the development of partner strategies to allow the increased uses of inputs.

d. In India, the pulses value chain increases the efficiency of pulse processing of pulses firms by adopting the primary and secondary activities in the pulses value chain, which generate the quality feature of grinding, procuring mixing, milling, etc. These are adopted for improved soil enrichment, generating quality pulses and affordable prices for pulses commodity.

e. Pulses value chain made direct improvement of pulses processing firms through the adoption of value chain approach to improve the internal primary and secondary activities related to processing, grinding, mixing, etc to generate the low cost and value-added pulses commodities as per the market demand and meet the cost of manufacturing.

Scope

The sustainability performance measurement shows the present financial status of pulse processing firms and reveals the importance of the sustainability performance of pulse processing firms that made a direct impact on the growth and development of pulse firms, also generated employment opportunities in pulse sectors, and made enlargement of pulse value chain practices. The pulse value chain practices have made a direct impact on the GDP of the country and raised the economy. With the support of value-addition practices, more quality processed food is generated according to customer choices. Sustainability performance

indicators are applied in pulse firms to measure the performance of pulse value chain practices and identify the prospect of the firm through the internal and external operation of firms and also provide skilled labor to pulse processing facilities and maintain the supply chain network.

Limitations

The major limitation of the study is based upon literature review focusing on pulse production, pulse processing, and pulse value chain practices, which give in-depth information and show the last five years data related to the export, import, and availability of pulses in tomes. Also, discussing only about the growth and opportunities of Indian pulse processing industries. The major constraint that occurs during pulses production is the lack of availability of quality seeds, lack of funds, lack of supply chain facilities, and other climate change problems, which become hurdles for the growth of pulses as well as processing. Therefore, all pulse processing should adopt the pulses value chain and risk mitigation strategy for reducing those risk and forced the firms to adopt suitable measures and techniques to remove and / or reduce the impact of aforesaid constraints. The current study performed the status of pulse production in the country and provided a suitable design of pulse value chain practices, developed the feasible design, and generated the sustainability for the continuous growth of the pulses industry. In recent decades, the changes made upliftment of production and consumption patterns and promoted the high-quality grains and seeds. Pulse trade produced high-value products, which is increasingly raising the exports of products and has adopted the growth of pulse value chain practices that showed declining of exports with high value of products.

Suggestions

The case study shows the actual status of pulse production in India and the growth of pulse production from the last seven preceding years that shows pulse production increased every year. The government must consider major cereals or millets of the country that fulfill the protein requirement as well as become the largest substitute of animal protein. The government is required to make several policies related to increasing the pulse production capacity and introducing advanced methods and innovative techniques for improving the pulse production capacity. At the same time, it is very important to generate awareness regarding the importance of value-addition practices during the time of pulse production. All pulse manufacturing should adopt the value-addition practices and implement the pulses value chain in their supply chain management so that quality pulses are produced and supplied to every trader and retailer. The case study shows the importance of value chain practices in two countries for increasing revenue and raising the per capita. Pulse firms must adopt the proper strategy for supply chain distribution and the adoption of processing.

Conclusion

The present research envisaged into pulse processing firm, which generates efficiency and develops business opportunities. The pulse value chain adopted the risk mitigation strategy that minimizes the risk, generates awareness, and controls the risk. Also, developed the risk strategic planning to overcome the constraints during the implementation of the pulse value

chain practices in pulse firms. The risk mitigation strategy developed the innovative technology, sustainability measures techniques, and procurement process to achieve the production capacity, and made the sustainable development goal of pulses firms that include all parameters and improve the governance mechanism for large and small firms, upgrading the strategies to generate employment opportunity that increase the inflow of FDI investment, adaptation of new international mechanism and practices. Pulses are applied in medical treatment to improve the neuro system and eliminate chronic diseases. There are several benefits of pulses to human health, which improve the immune system and become a large substitute for animal protein. Sustainability performance measurement facilitates to increase the life of firms, reduce the internal and external constraints of pulse firms, and also conserve the renewable and non-renewable resources that become beneficial for pulse processing.

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Green Audit in Academic Institutions of Bargarh Town in Odisha – A Conceptual Overview

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Abstract

A green audit represents a critical evaluation of an organization's environmental performance, aiming to identify the opportunities for ecological improvement. This research study focuses on comprehensive green audit of two schools located in Bargarh Town, Odisha, to assess their environmental management practices and pinpoint areas requiring enhancement. The data collection is carried out through surveys, structured interviews, case studies and analyzed using advanced environmental analysis methodologies. Moreover, a bespoke carbon footprint calculation tool has been developed to facilitate quantitative assessment. This tool enables institutions to input data regarding energy consumption, waste generation, transportation metrics and has generated detailed analytical reports. The findings underscore the efficacy of green audits in fostering sustainability and reducing ecological footprints within the academic settings. The present study provides few recommendations along with a robust framework for the adoption of sustainable practices in higher education institutions.

Keywords: Green Audit, Carbon Footprint, Sustainability, Environmental Management, Higher Education.

Introduction

The academic institutions always play a fundamental role in shaping societal development by imparting knowledge and through fostering ethical, social, and environmental responsibilities. As centers of learning and innovation, they bear a significant duty towards environmental stewardship, ensuring that their practices align with the sustainability principles (Shrivastava, 1995). Moreover, the integration of eco-friendly measures such as energy efficiency, waste management, and water conservation not only reflect an institution's commitment to

sustainability but also sets a precedent for students, faculty, and staff to adopt environmentally conscious behaviors (Wright, 2002). This research evaluates the environmental practices of two distinct academic campuses situated in Bargarh Town in Odisha, whereas Institution A, a renowned public school and Institution B, a private school. The present study envisages into conducting a comprehensive green audit by examining various parameters of environmental sustainability to assess and enhance the institutions' ecological footprint.

Key Areas of the Green Audit

Water Efficiency

Water is a crucial resource in academic institutions, and its efficient use is vital for sustainability. The audit assessed overall water consumption, conservation initiatives such as low-flow fixtures, and the presence of rainwater harvesting systems. By implementing effective water management practices, institutions can reduce wastage, lower costs, and promote sustainable resource use (Alshuwaikhat & Abubakar, 2008).

Wastewater Management

Wastewater treatment and recycling measures were evaluated to determine the efficiency of sewage treatment plants (STPs) and greywater recycling systems. Proper wastewater management not only prevents contamination of local water bodies but also ensures compliance with environmental regulations (Lozano, 2010).

Solid Waste Management

This aspect of the audit focused on waste segregation, disposal mechanisms, and composting practices. Effective solid waste management involves the separation of biodegradable and non-biodegradable waste, the establishment of composting units, and the promotion of zero-waste initiatives on campus.

E-Waste Management

With the rise of digital education and technological reliance, academic institutions generate significant amounts of electronic waste. The audit examined e-waste disposal methods, including recycling initiatives and partnerships with certified e-waste handlers to prevent environmental pollution caused by hazardous electronic components (Clugston & Calder, 1999).

Energy Efficiency

Energy consumption patterns were analyzed to identify inefficiencies and opportunities for integrating renewable energy sources such as solar power. The implementation of energy-efficient appliances, LED lighting, and smart energy management systems were considered crucial elements in reducing the carbon footprint of the institutions.

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Emissions Management

The audit quantified greenhouse gas emissions from campus activities, including transportation, electricity use, and laboratory operations. Identification of mitigation strategies, such as the promotion of public transport, electric vehicles, and carbon offset programs, was explored to reduce the environmental impact (Shrivastava, 1995).

Indoor Air Quality

Monitoring air quality standards within classrooms, laboratories, and administrative buildings was an essential component of the audit. Poor indoor air quality can affect the health and productivity of students and faculty, making it necessary to implement adequate ventilation, air purification, and green landscaping solutions.

Light and Acoustics

The usage of natural lighting and noise control measures were assessed to ensure a conducive learning environment. Optimizing daylight reduces reliance on artificial lighting, leading to energy savings, while effective acoustic designs minimize noise pollution and enhance learning outcomes.

Sustainability Initiatives

A key objective of the audit was to identify programs promoting environmental awareness among students and faculty. Sustainability initiatives such as tree plantation drives, eco-clubs, environmental workshops, and research projects were evaluated for their impact on fostering a culture of ecological responsibility (Clugston & Calder, 1999).

Green Audits

The concept of ‘Green’ in green audits emphasizes more on eco-friendly initiatives and activities. Moreover, the term ‘Green’ encapsulates the concept of ‘Global Readiness in Ensuring Ecological Neutrality’, emphasizing a holistic and systemic approach to identifying and analyzing environmental dynamics within academic institutions. A green audit serves as a diagnostic tool that not only assesses the current environmental performance of an institution but also provides actionable insights for future improvements. By systematically evaluating various sustainability parameters, institutions can enhance their operational efficiency, reduce costs, and minimize their environmental impact. Furthermore, green audits are essential for fostering an ethos of environmental responsibility within educational institutions. They enable campuses to identify resource inefficiencies, implement cost-saving measures, and contribute to national and global sustainability goals. In India, the National Assessment and Accreditation Council (NAAC) has kept a mandatory compliance on annual Green Audit Reports for higher education institutions (Lozano, 2010).

The green audits reinforce institutional accountability and ensure that sustainability remains a core focus of academic governance. Therefore, by conducting green audits, academic institutions not only fulfill regulatory requirements but also demonstrate leadership in sustainable development. In furtherance, their commitment to environmental stewardship influences future generations, instilling a culture of sustainability among students who will become tomorrow's decision-makers, policymakers, and environmental advocates. The integration of eco-friendly practices in academic institutions is no longer an option but a necessity. As centers of learning and progress, colleges and universities have the responsibility to set an example in sustainable living. Through green audits, they can evaluate their environmental footprint, optimize resource usage, and contribute to global efforts in combating climate change. The Institutions A and B in Bargarh Town at Odisha, serve as case studies in this present study, which highlights the significance of structured environmental assessments in fostering a more sustainable academic environment. The insights gained from such audits pave the way for more efficient, eco-conscious campuses benefits the environment and enrich the learning experience of students and faculties.

Literature Review

Green audits play a crucial role in evaluating and improving the environmental sustainability of academic institutions by assessing the resource consumption, waste management, and energy efficiency. Moreover, green audits are rooted in environmental management principles and mandated by accreditation bodies like NAAC, which helps the institutions to implement sustainable practices **(**Lozano, 2010**)**. The key areas comprise of water efficiency through rainwater harvesting and wastewater treatment **(**Alshuwaikhat & Abubakar, 2008**)**, waste management via recycling and composting **(**Clugston & Calder, 1999**)**, and energy optimization using solar panels and LED lighting. Additionally, assessing greenhouse gas emissions, air quality, optimizing lighting and acoustics contribute to healthier and more sustainable learning environments (Wright, 2002). Institutional sustainability initiatives, including eco-clubs and environmental workshops, further promote awareness and behavioral change. Thus, by identifying inefficiencies and fostering long-term sustainable practices, green audits will provide a structured framework for ecological stewardship. Also, future research is needed to refine assessment methodologies and measure long-term impacts.

Need & Significance

Today, educational campuses consume significant resources, including water and energy, and generate substantial waste, there is a pressing demand for structured assessments like green audits to identify inefficiencies and implement sustainable solutions. With global accreditation bodies emphasizing sustainability as a key evaluation criterion, institutions must integrate eco-friendly practices to reduce their environmental impact (Lozano, 2010). Additionally, fostering environmental awareness among students and staff is essential for promoting long-term behavioral changes and institutional commitment to sustainability (Wright, 2002). The need for this study arises from the growing urgency to enhance environmental sustainability in academic institutions. Keeping this in view, the present study aims to highlight the importance

of green audits in driving institutional sustainability, optimizing resource use, and ensuring compliance with evolving environmental regulations.

Objectives

- To conduct green audit in the educational institutions and understanding their role in adopting and promoting environmental awareness for sustainability

- To identify the potential environmental risks and highlighting the importance of green audit

Methodology

Study Area

Bargarh is an emerging city and municipality in Bargarh district in the state of Odisha in India. It is the administrative headquarters of Bargarh District. Bargarh is popularly known for intensive cultivation of 'paddy', therefore called "Bhata Handi" of Odisha with a population of 80,000 with 17 schools in Bargarh. The study carried out the survey at two schools viz. institution A (public school – Kendriya Vidyalaya) and institution B (private school – Rotary Public School) at Bargarh at Odisha namely).

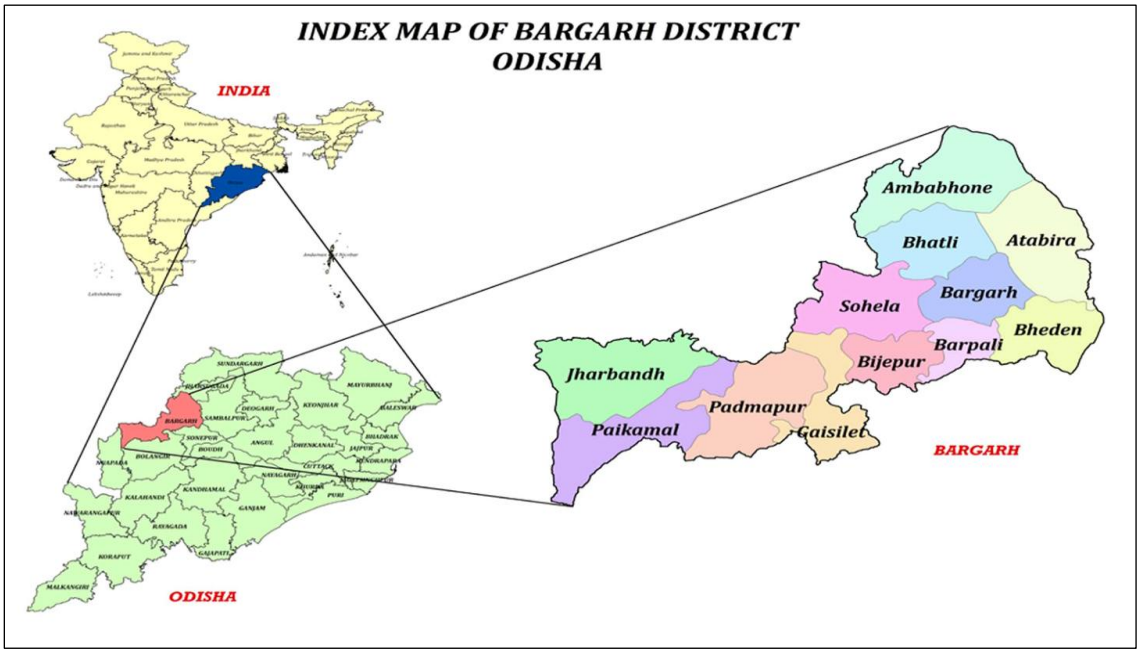

Fig. 1

Institution A

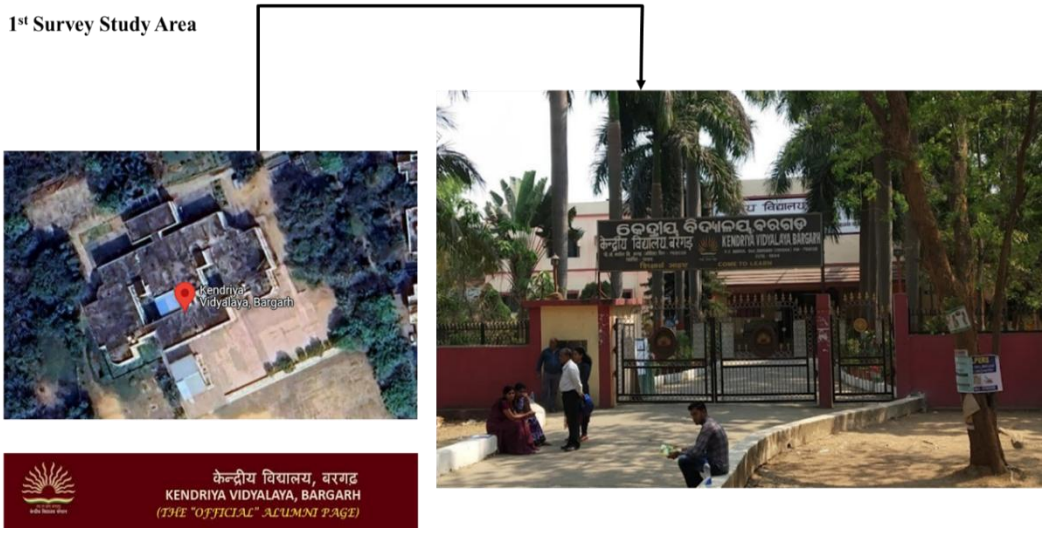

Fig. 2

Institution B

Fig. 3

Source: https://bargarh.kvs.ac.in & https://rotarypublicschool.org.in

The present research study has adopted mixed methods. In furtherance, the data collection has been carried out using the following procedures:

Observation & Documentation Review: Examination of institutional policies, utility records, and maintenance logs.

Interviews: Engagement with key stakeholders, including administrative personnel, faculties and students.

Data Collection & Analysis: Utilization of advanced tools to measure energy usage, waste production, and water efficiency.

Comparative Analysis: Contrasting the environmental practices of the two institutions to derive actionable insights.

The key steps included the design of tailored surveys, structured campus inspections, and deployment of data visualization techniques to enhance interpretability.

Data Acquisition

The green audit was conducted for two institutions with distinct operational contexts, focusing on evaluating their environmental sustainability practices, resource utilization, and ecological challenges.

Educational Institutions Under Review

Institution A: Kendriya Vidyalaya, Bargarh, Odisha

Type: Public Educational Institution.

Key Features

- Substantial greenery across the campus.
- Integration of traditional conservation practices such as water harvesting and minimal energy use.
- Focus on environmental awareness among students and staff.

Ecological Strengths

- Preserved green spaces that support biodiversity.
- Sustainable waste management initiatives, including composting and segregation.

Challenges Identified

Limited implementation of modern eco-friendly technologies, such as solar panels or advanced waste processing systems.

Institution B: Rotary Public School, Bargarh, Odisha

Type: Private Educational Institution.

Key Features

- Modern infrastructure, including high-tech classrooms and centralized air conditioning.
- Lesser focus on maintaining green cover due to space constraints.

Ecological Challenges

- Higher energy consumption due to extensive use of modern facilities.
- Limited waste management systems, with reliance on conventional disposal methods.
- Need for integrating sustainability measures within operational frameworks.

Methodology for Data Collection

Surveys

Surveys are distributed to key stakeholders, including students, faculty, and administrative staff, to gather insights on:

Resource Utilization: Water, electricity, and other utilities.

Energy Consumption: Patterns of electricity use in daily operations.

Waste Management: Existing practices for managing organic, recyclable, and hazardous waste.

Campus Inspections

- Direct physical inspections of both campuses are conducted to:
- Validate survey responses through on-ground observations.
- Identify areas where resource inefficiencies or ecological lapses occur.
- Assess the condition of green spaces, waste disposal units, and energy systems.

Structured Questionnaires

- Focused on specific environmental metrics, such as:
- Carbon footprint estimation based on energy and resource use.
- Biodiversity assessment, particularly for Institution A's green spaces.
- Awareness levels among stakeholders about sustainability practices.

Preliminary Observations

- **Institution A** demonstrates strong adherence to traditional environmental practices, leveraging its natural greenery for ecological benefits but lacks technological interventions to optimize sustainability further.

- **Institution B**, despite its advanced infrastructure, requires significant efforts to address its ecological challenges, including high energy demands and inefficient waste management systems.

This comprehensive green audit lays the foundation for targeted recommendations to improve environmental performance for both institutions.

Results & Observations

Comparative Analysis of Environmental Metrics

- The green audit provided a comparative evaluation of **Institution A (Kendriya Vidyalaya)** and **Institution B (Rotary Public School)**, focusing on water efficiency, waste management, and energy efficiency. These insights highlight strengths, challenges, and opportunities for improvement for each institution.

Water Efficiency

Institution A: Kendriya Vidyalaya

- **Current Practices**

- Successfully implements a rainwater harvesting system that meets 60 percent of the campus's water requirements.
- Strong reliance on natural water conservation techniques aligned with traditional sustainability practices.

- **Challenges**

- Lack of modern water-efficient technologies, such as automated irrigation systems and water recycling plants.
- The remaining 40 percent dependency on external water sources indicates scope for further optimization.

- **Recommendations**

- Expand rainwater harvesting infrastructure to cover additional buildings.
- Introduce greywater recycling systems for landscaping and non-potable uses.

Institution B: Rotary Public School

- **Current Practices**

➢ Limited implementation of water conservation methods, with minimal emphasis on rainwater harvesting or greywater reuse.
➢ Dependency on municipal water supply highlights vulnerability during periods of water scarcity.

- **Challenges**

➢ Absence of any significant water management framework or infrastructure.

- **Recommendations**

➢ Install rainwater harvesting systems to meet a portion of the water demand.
➢ Implement low-flow fixtures and leak detection systems to reduce wastage.

Waste Management

Institution A: Kendriya Vidyalaya

- **Current Practices**

➢ Limited segregation practices at the source impedes effective recycling.
➢ Organic waste management practices, such as composting, are sporadic and underutilized.

- **Challenges**

➢ High dependency on local municipal waste disposal systems, which lack recycling efficiency.

- **Recommendations**

➢ Implement a three-bin segregation system (biodegradable, recyclable, non-recyclable).
➢ Train students and staff in waste segregation practices.
➢ Introduce campus-level composting units for organic waste.

Institution B: Rotary Public School

- **Current Practices**

➢ Comprehensive e-waste recycling systems ensure environmentally safe disposal of obsolete electronic devices.

- Robust segregation systems categorize waste into biodegradable, recyclable, and non-recyclable streams, significantly reducing landfill contributions.

- **Challenges**

- Lack of initiatives for organic waste management (Ex:composting or biogas generation).

- **Recommendations**

- Establish on-campus composting facilities to manage organic waste.
- Strengthen community awareness campaigns to enhance participation in recycling programs.

Energy Efficiency

Institution A: Kendriya Vidyalaya

- **Current Practices**

- Primarily reliant on grid electricity for energy needs, which increases carbon footprint.
- Absence of renewable energy systems such as solar panels.

- **Challenges**

- Rising energy costs due to heavy grid dependency.
- Missed opportunities to leverage renewable energy, despite the potential for solar power generation.

- **Recommendations**

- Install rooftop solar panels to gradually transition to renewable energy.
- Conduct energy audits to identify and replace inefficient electrical systems with energy-efficient alternatives (Ex: LED lights).

Institution B: Rotary Public School

- **Current Practices**

- Partial reliance on solar energy through installed solar panels, reducing grid dependency to some extent.
- Energy-efficient appliances used in parts of the campus.

- **Challenges**

➢ Insufficient solar panel capacity limits the institution's ability to meet energy demands sustainably.
➢ Lack of a systematic approach to monitor and reduce energy consumption.

- **Recommendations**

➢ Expand solar energy infrastructure to meet a larger share of energy requirements.
➢ Implement smart energy management systems for real-time monitoring and optimization.

Key Insights & Opportunities for Improvement

- **Water Efficiency**

➢ While Institution A has commendable rainwater harvesting practices, both institutions must adopt advanced water conservation techniques to reduce external dependency.

- **Waste Management**

➢ Institution B demonstrates leadership in e-waste recycling, but Institution A must improve its waste segregation practices and adopt similar initiatives.

- **Energy Efficiency**

➢ Both institutions must invest in renewable energy sources, with Institution B requiring capacity expansion and Institution A needing to initiate solar energy adoption.

Thus, by addressing these recommendations, both institutions can enhance their environmental sustainability and serve as models for other educational entities.

Carbon Footprint Tool

The custom-developed carbon footprint tool is an advanced application designed to help organizations to effectively monitor, analyze, and reduce their carbon emissions. It features an intuitive data input interface that simplifies the process of entering environmental data such as energy consumption, waste management, and transportation activities. With customizable fields and batch upload capabilities, the tool ensures accurate and efficient data handling, even for users with limited technical expertise. Once the data is entered, the tool automatically generates detailed environmental performance reports, offering insights into total carbon emissions, emissions by category, and year-over-year comparisons.

These reports are formatted to align with global standards, such as the GHG Protocol and ISO 14064, aiding organizations in meeting regulatory requirements. The tool’s interactive

dashboards and graphical visualizations make it easy to identify carbon emission trends over time, wherein the line graphs, bar charts, and pie charts provide a clear depiction of emissions by scope and activity type, helping users pinpoint inefficiencies. In addition to this analysis, the tool offers actionable recommendations to reduce emissions such as adopting renewable energy, enhancing energy efficiency, or optimizing waste management.

These aforesaid recommendations are prioritized based on impact potential, guiding users toward effective decision-making. Screenshots of the tool's interface and sample reports demonstrate its user-friendly design and utility, showcasing features like real-time data updates, detailed trend analysis, and comprehensive summaries of actionable steps. This tool serves as a powerful asset for organizations seeking to integrate sustainability into their operations, improve environmental performance, and communicate progress to stakeholders effectively.

- Intuitive data input interfaces.
- Automated generation of detailed environmental performance reports.
- Visualization of carbon emission trends and actionable recommendations.

The screenshots of the tool's interface and sample reports have been included to demonstrate its utility, which is indicated in Fig 4.

Data Entry & Data Coding

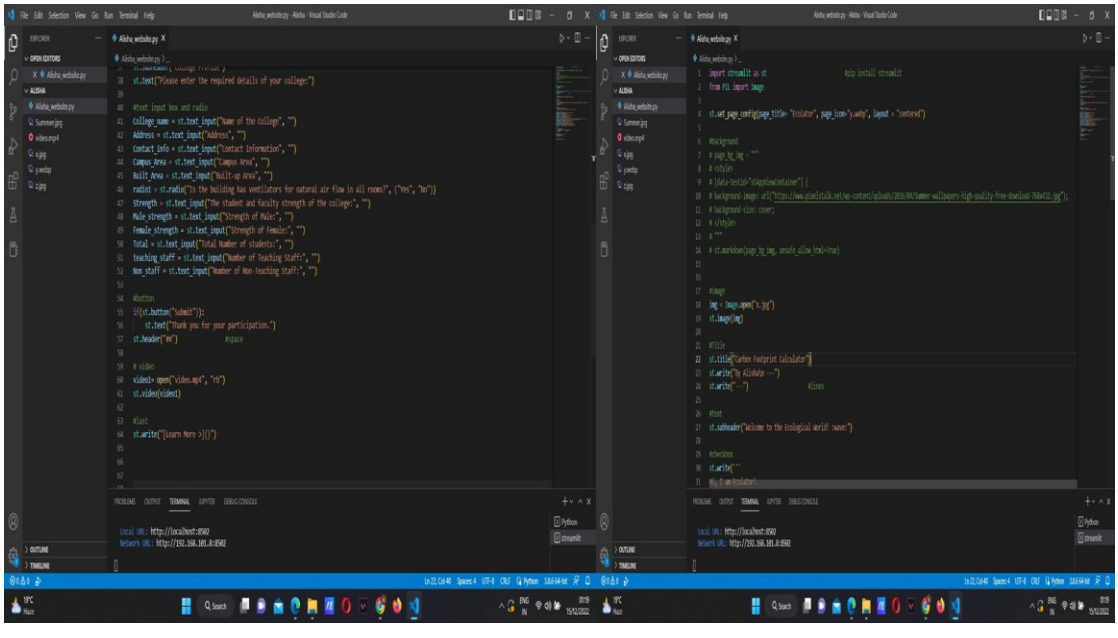

Fig. 4

Discussion

The findings of this green audit provided critical insights into the strengths and areas requiring improvement within the two academic institutions, offering a structured approach to enhancing sustainability practices. The results highlighted that the need for targeted interventions that address specific inefficiencies while leveraging existing strengths (Alshuwaikhat & Abubakar, 2008).

Institution A

Institution A has demonstrated a commendable commitment to water conservation and community engagement which is one of the key components of sustainability. However, the challenges remain in waste management and energy efficiency, necessitating immediate corrective measures to enhance environmental performance (Lozano, 2010). The following strategies are recommended:

Strengthening Waste Management Protocols

Institution A should establish a structured waste segregation system, ensuring the proper categorization and disposal of organic, recyclable, and non-recyclable waste. Moreover, integrating recycling initiatives into daily operations and setting up designated collection points across the campus can streamline waste management (Wright, 2002). Also, conducting awareness programs and workshops will help educate students and staff on responsible waste disposal. Furthermore, partnerships with local recycling agencies and waste management companies should be pursued to ensure efficient waste processing.

Investing in Renewable Energy Solutions

To reduce dependence on conventional electricity and minimize the carbon emissions, Institution A should prioritize solar energy adoption. Installing solar panels on rooftops and open spaces can significantly decrease electricity costs and reliance on fossil fuels (Disterheft et al., 2012). In furtherance, implementing energy-efficient lighting systems, such as LED bulbs and motion-sensor lighting, will further optimize energy consumption. Additionally, the institution should explore financial incentives and grants available for renewable energy projects to facilitate a smoother transition.

Institution B

Institution B has excelled in waste segregation and e-waste recycling, setting an example for responsible waste management. However, it lags in water conservation and renewable energy implementation, both of which are essential for sustainable resource management (Shriberg, 2002). Thus, to address these shortcomings, the following initiatives should be undertaken:

Implementing Rainwater Harvesting Systems

Institution B should introduce a rainwater harvesting system to efficiently collect and store rainwater for non-potable purposes such as irrigation, toilet flushing, and cleaning. This measure will help reduce dependency on municipal water supplies and conserve groundwater resources (Velazquez et al., 2006). Furthermore, establishing percolation pits and recharge wells can further enhance water retention and prevent wastage. Awareness campaigns should also be launched to promote water conservation among students and staff.

Expanding Renewable Energy Capacity

To align with sustainable energy practices, Institution B should enhance its renewable energy infrastructure by expanding existing solar power installations or integrating wind energy solutions wherever feasible (Ferrer-Balas et al., 2009). In addition to this, investing in battery storage solutions will improve energy reliability and facilitate efficient power distribution across the campus. Also, promoting energy-efficient behaviors, such as switching off lights and electronic devices when not in use will contribute to overall energy conservation (Tilbury, 2011).

Broader Relevance

The research underscores the importance of green audits as a diagnostic tool for fostering sustainability in educational institutions. Thus, by implementing these targeted sustainability strategies, both institutions can enhance their environmental performance, reduce their ecological footprint, and serve as models for other academic institutions. This green audit provides a structured framework for guiding the future sustainability initiatives thereby ensuring that educational institutions play a proactive role in environmental conservation and resource management (Cortese, 2003). Moreover, by identifying the inefficiencies and proposing practical solutions these green audits can serve as a blueprint for broader environmental management practices applicable to similar institutions globally.

Suggestions

To enhance sustainability, Institution A should improve waste management by introducing proper segregation, recycling programs, and regular audits. Also, by investing in solar panels, energy-efficient lighting, and power-saving policies can boost energy efficiency. Moreover, conducting awareness programs, workshops, and sustainability-focused activities will further promote green practices. The Institution B should implement rainwater harvesting, conduct water audits, and install water-saving fixtures to enhance conservation. Furthermore, by expanding the solar energy capacity and exploring alternative renewable energy sources will improve energy sustainability. In furtherance, by collaborating with environmental organizations, organizing knowledge-sharing sessions, and encouraging student participation in green projects will strengthen both institutions' environmental commitment and long-term sustainability. The future researchers could conduct longitudinal studies to evaluate the long-term impact of these initiatives.

Conclusion

Green audits provide an essential framework for assessing and improving the environmental performance of academic institutions. This research study has focused on two distinct educational institutions in Bargarh at Odisha and demonstrates the critical role of targeted sustainability initiatives in achieving ecological balance. The observations by the researchers have revealed that tailored strategies, such as the adoption of renewable energy systems and improved waste management protocols, can significantly reduce ecological footprints. The development and implementation of the custom carbon footprint tool represent a pivotal advancement in environmental assessment methodologies. Also, by offering user-friendly interfaces and exclusive analytical capabilities, the aforesaid tool empowers these educational institutions to frequently monitor and manage their environmental impact continuously. The findings exhibited in this research study has advocated the integration of green audits as a mandatory practice within the educational institutions. Furthermore, by fostering environmental awareness and implementing actionable recommendations, these institutions not only achieve compliance with regulatory standards but also contribute meaningfully to global sustainability efforts.

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Conceptual Framework for Assessment of Premenstrual Symptoms

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Abstract

Premenstrual symptoms are physical, emotional, and behavioral changes that affect women of reproductive age during the luteal phase of their menstrual cycle. Numerous research findings reveal that these symptoms are related to life's stressors and it impacts overall quality of life. In recent times, women workforces face several challenges to balance their varied roles, which leads to stress and other health issues. Moreover, focusing on reproductive health is quite essential for women as it involves cyclic hormonal fluctuations and is directly linked to emotional disturbances. Since emotional balance plays a significant role in work-life balance as well as overall well-being, this study intends to review various concepts and factors involving premenstrual symptoms and provide an assessment framework from a psychological perspective.

Keywords: Premenstrual Symptoms, PMS Factors, PMS Framework, PMS Assessment, Work-Life Balance

Introduction

In this digital era, women professionals need to equip themselves and cope with ever-changing environment in their day-to-day life. Mental health is a vital factor for assessing quality of life and work-life balance. Studies on premenstrual symptoms gains importance in case of working women, as they are expected to address multiple responsibilities both at professional and personal level, which in turn creates various stressors in their life, thereby affecting the health, particularly problems related to menstrual cycle. During the monthly menstrual cycle, women experience both physical and emotional stress. The premenstrual phase, in particular, is marked by a range of symptoms that vary from mild to moderate, and in some cases, it can be severe. Moreover, mood disturbances during this phase can be a persistent concern, which requires women to find effective coping strategies. Emotional discomfort is mainly attributed to various stressors, which are influenced by daily experiences, lifestyle, and other biological and psychological factors. Additionally, these emotional disturbances tend to recur every menstrual cycle, and this necessitates a thorough investigation to identify the underlying stressors. Findings from previous research indicates that stress is a major cause in aggravating the

premenstrual symptoms, and many studies are focused on the emotional aspects of these symptoms.

Objective

To develop a conceptual framework for assessment of premenstrual symptoms

Conceptual Review

The premenstrual symptoms are predominantly associated with the rise and fall of oestrogen and progesterone, the two hormones that regulates the female reproductive cycle. It is linked to the premenstrual phase of the cycle, which begins approximately after ovulation and continues until the onset of the next menstrual period. Fluctuations in neurotransmitters such as serotonin, catecholamine, and gamma-aminobutyric acid, and their interaction with the progesterone levels along with stress and other biological, nutritional, and environmental factors are believed to trigger the symptoms. Also, serotonin deficiency may cause sleep problems, fatigue, food cravings, and depressed mood, which may get aggravated during the premenstrual phase. There are over 100 to 150 associated premenstrual physical, behavioural, and emotional symptoms; however, the number of symptoms most women experience is very limited. The diagnosis of premenstrual symptoms, especially the emotional disturbances, is quite challenging as the degree of intensity and pattern varies from each person. The key is to identify consistency of symptoms by tracking them over a few cycles to establish a clear connection, and identify various biological, psychological, and environmental factors that are exacerbating this.

Prevalence of Premenstrual Symptoms

Several studies indicate that premenstrual symptoms are prevalent across different cultures. It can vary based on age, ethnicity, physical characteristics, and other socio-demographic and health factors. The symptoms can range from mild to severe physical and emotional distress, highlighting the importance of understanding and managing it effectively.

In a study of involving more than 3000 women, about 91 percent of the participants report at least one premenstrual symptom, and its prevalence is considerably higher among the middle-aged group (35-44 years), and associated with poor physical health and psychological distress (Tschudin et al., 2010). Severe premenstrual problems affect 3-8% of women, and it primarily involves psychological symptoms; moreover, it significantly impacts their daily activities and quality of life (Dennerstein et al., 2012). A population-based study in the age group of 18-45 years among Chinese women reveals most common emotional symptoms are irritability, anger outbursts, anxiety, confusion and depression (Qiao et al., 2012).

Research reports from the Middle-East, Europe, a few South American, African, and Asian countries including India reveal that the women of reproductive age experience premenstrual symptoms with a prevalent rate of 47.8 percent (Direkvand-Moghadam et al., 2014). In a study from Myanmar, prevalence of PMS with higher proportion of the participants meeting criteria

for PMDD is identified about 54.4% among medical students. Among the commonly associated premenstrual mood symptoms, poor concentration and irritability are the most frequent (Oo et al., 2016). Also, among Iranian women, the overall prevalence of PMS is estimated at 70.8 percent (Ranjbaran et al., 2017).

A study by Fatemi et al. (2019) also iterates that 80 to 90 percent of women display at least one symptom during the premenstrual phase; however, in about 2.5 to 3 percent of women, the symptoms are severe enough to affect their activities of daily living and interpersonal communications. In an internet-based survey of over 40,000 Dutch women, 77% experienced psychological complaints, and about 38% mentioned that the symptoms interfered with their daily life. (Schoep et al., 2019). Mild to moderate symptoms including anger and guilt, lack of interest in activities, increased sensitivity, decreased energy, and difficulty in concentrating are found among college students (Matsumoto et al., 2019). A similar study from Ethiopia provides pooled prevalence of PMS to be 53.87% among university students and 56.19% among high school students (Geta et al., 2020).

A review estimated that PMS prevalence ranges from 14.3% to 74.4% and PMDD from 3.7% to 65.7% among reproductive-aged females in India, and this may be influenced by diagnostic tools, socio-demographic factors, and cultural differences. Countries such as Iran (70.8%), Sri Lanka (65.7%), Pakistan (79.9%) report higher PMS rates, while Taiwan (39.85%) is similar to India, and low rates are found in Myanmar (37.3%) and China (21.1%). PMDD prevalence is also higher in India than in China (2.1%) and Pakistan (5.5%), but lower than Ethiopia (54.5%). In this study, adolescents particularly show high prevalence, which significantly impacts their quality of life (Dutta & Sharma, 2021).

PMS can lead to a variety of physical consequences, psychological conditions, behavioural changes, and social complications that hinders the daily functioning of women including their work, personal activities, and relationships. It also adversely impacts quality of life especially during the premenstrual phase (Hofmeister & Bodden, 2016; Siahbazi et al., 2018; & Quick et al., 2019).

Findings from an extensive study involving over 2 lakh respondents from 140 countries reveal that the most common symptoms are food cravings (85.28%), mood swings or anxiety (64.18%), and fatigue (57.3%). The study mentions that the mood symptoms does not vary by age group, which implies the fact that mood changes during the premenstrual phase are a permanent issue (Hantsoo et al., 2022).

Stressors

Stress and emotions are closely related, with stress having significant impact on emotional responses and intensifies the negative emotions in particular. Chronic stress leads to increased sensitivity and mood swings, and emotional regulation becomes challenging under stress, leading to exhaustion, irritable mood and depressive symptoms.

A study by Gollenberg et al. (2010) mentions that women who experienced high stress in the previous month are bound to experience increase in intensity of premenstrual symptoms in the following cycle. Fluctuations in stress levels between the cycles are associated with changes in symptom intensity, with more severe symptoms occurring after periods of elevated stress. Persistent high stress before both cycles leads to exacerbation of symptom severity over time. These findings suggest a positive correlation between psychosocial stress and premenstrual symptoms. The study also highlights that stress-induced changes in ovarian hormones and neurotransmitters may act as contributors, and that stress reduction programs may be a noninvasive and cost-effective approach for symptom management.

Hormonal fluctuations throughout a woman's life significantly impact mood and mental health. Transitions such as postpartum, menopause, and even subtle hormonal shifts during the menstrual cycle can increase vulnerability to mood disturbances. Women are prone to menstrual cycle-related disorders like PMS and PMDD, wherein hormonal changes increase the risk of mood disorders. However, the underlying causes involve complex interactions between the ovarian hormones as well as increase in sensitivity of the brain's GABAergic system and low serotonin levels contribute to mood-related symptoms. Research evidence highlights the role of genetic and epigenetic factors in linking the hormonal imbalances to stress responses. Also, the usage of hormonal contraceptives may contribute to elevated mood symptoms. The heterogeneity in symptom type and severity emphasizes the need for personalized treatment approach for women with severe premenstrual symptoms (Barth et al., 2015; Tiranini & Nappi, 2022; Hantsoo & Payne, 2023).

Liu et al. (2017) mentions that when investigating neurophysiological reactivity and emotional responses to stressors, women with PMS exhibit greater negative affect and reduced positive affect after exposure to stressful conditions. Furthermore, these effects persist regardless of the menstrual cycle, which suggests that continuous and lasting changes have occurred in women with PMS. Another study reveals strong association of psychological factors such as perceived stress, neuroticism, and coping strategies with PMS and PMDD (del Mar Fernández et al., 2019). Other studies also mention a relatively high prevalence of the premenstrual symptoms and its significant relationship with dietary habits and psychosocial status, whereas, moderate symptoms affect social and work lives of women. Among women, the symptoms are mainly associated with depression, occupational stress, sleep quality, sleep disturbances, and eating attitude problems (Abu Alwafa et al., 2021; Çitil & Çitil Canbay, 2022; Yi et al., 2023; & Wang et al., 2024).

Emotions, Dreams & Premenstrual Symptoms

Dreams play a major role in understanding emotions since the content and intensity of dreams predominantly contain emotions. Most of the dreams mirror our emotional experiences, especially those linked to stress, anxiety, or unresolved feelings. Additionally, emotions, either positive or negative, can influence the mood and themes of our dreams. The concepts of dreams and its varied applications are in the fields of neurology and psychotherapy. Moreover, dreams also play a crucial role in emotional processing, and act as contributor to both physical and mental well-being.

A study by Wiebe et al. (2007) reveals increased negative dream emotions during the late premenstrual phase among women with minimal and severe premenstrual symptoms, and this affects sleep quality and mood. Also, aggressive dream contents are present mainly during this phase, which indicates that hormonal fluctuations have significant effect on the emotional content of dreams. Moreover, women with severe symptoms report high frequency of unpleasant dreams during this phase. Another research also indicates that experiencing negative emotions at daytime are more likely to impact the dream's emotional content (Levin & Nielsen, 2009).

During the pre-ovulatory phase, dreams tend to exhibit highest levels of incongruity and positive emotions; and during the premenstrual phase, dreams are longer with a larger number of female characters and negative emotions. This suggests that hormonal fluctuations across the menstrual cycle may influence dreaming patterns (Natale et al., 2003, Ilias et al., 2019). Women's dreams are primarily based on emotions, rather than interactions around activities and contain low levels of aggression. Dream reports also include statistical markers that reflect what the individual experiences in real life (Fogli et al, 2020).

The role of dreaming in emotion regulation suggests that positive and negative emotions experienced during wakefulness might follow distinct but parallel pathways during sleep. While positive emotions may fade away in dreams, negative emotions are likely to persist or even intensify, which indicates complex emotional processing during sleep. This finding shows that understanding of dreams is important, as this might support various strategies for managing emotions and potentially contributing to improved psychological well-being (Conte, et al., 2020).

Other studies also mention that dreams play a significant role in psychological adaptation by helping with mood regulation. Emotions in dreams are often more negative than those felt before sleep, but emotions upon waking tend to be more positive, which indicates that emotional regulation takes place during sleep and helps in the improvement of mood while waking (Barbeau et al., 2022). The emotions experienced during waking hours are carried over into dreams, impacting the sleep quality; and consistent negative emotions leads to more distressing dreams and poor sleep (Mallett et al., 2022). Additionally, studies indicate that women with PMS/PMDD experience lower melatonin levels and higher night-time core body temperature, which suggests that this group of women tend to have poor sleep quality (Kamel et al., 2021 & Nexha et al., 2024).

Dreams can help regulate emotions by associating potential threats with new, non-fearful contexts, which may reduce anxiety and other negative emotions, serving as a form of emotional release or catharsis (Samson et al., 2023). Furthermore, dreams act as a platform for processing and integrating emotional experiences, mood regulation and resolving emotional conflicts (Barbeau et al., 2022; Zhang et al., 2024).

In women with PMDD, habitual cognitive emotion regulation strategies can improve momentary mood, and regular mindfulness appears to positively influence cortisol levels during the menstrual phase. These findings emphasize the need for further research on emotion

regulation and its interaction with the phases of menstrual cycle in order to better predict psychological and endocrinological changes, which in turn can facilitate customized treatment approaches for women in this group (Nayman et al., 2023).

To understand the origin of personal conflicts and stressors, women need to self-introspect and address the issues effectively and achieve mental preparedness, which in turn will enable them to handle the emotions and premenstrual emotional disturbances effectively.

Work-Life Balance

Studies show that work-related stress and added responsibilities can trigger or exacerbate premenstrual symptoms. These symptoms affect multiple aspects of woman's life, such as social interactions, relationships, work productivity, lifestyle, academic performance as well as physical and emotional health. Moreover, working conditions can impact overall quality of work life. Factors like pain, perceived stress, general health and absenteeism are all linked to the severity of these symptoms (Jahromi et al., 2011; Cheng et al., 2013; Sirisawasd et al., 2014; Hamaideh et al., 2014).

Severe premenstrual problems create economic burden for both women and the society. Hence, interventions focussing on management of psychological symptoms and work-related challenges could be beneficial, as this affects not only women but also has wider societal implications (EL-Hamid et al., 2013, Hammam et al., 2017). Working women professionals commonly experience symptoms during the premenstrual phase, such as difficulty concentrating, self-doubt, fatigue, tearfulness, emotional outbursts, heightened sensitivity and challenges with social interaction (Hardy & Hardie, 2017). Employees with moderate to severe symptoms face inability to meet job requirements, leading to difficulty concentrating at work, decreased productivity, increased absenteeism and impact on their overall quality of life (Hardy & Hunter, 2021). A study by Ponzo et al. (2022) also mentions that majority of women report that menstrual cycle issues impact their workplace productivity, and they feel unsupported and lack benefits or resources to address these issues properly.

Women with PMS also find it challenging to maintain focus, make decisions and meet deadlines, which increases the likelihood of workplace stress. Additionally, the emotional and physical discomfort associated with these symptoms can disrupt personal relationships and social activities, potentially causing isolation or strained interactions. Research suggests that factors like stress management, regular exercise, and dietary changes can help mitigate these effects. Implementing effective coping strategies such as engaging in positive activities, seeking support or utilizing healthcare services is essential for managing these symptoms (Yi et al., 2023; Liguori et al., 2023; Akın & Erbil, 2024).

The premenstrual symptoms significantly affect the middle-aged working women, as they often juggle multiple responsibilities, balancing both workplace and familial duties. Maintaining work-life balance is indispensable for women in order to meet their personal survival needs and also fulfill the family's economic requirements.

Conceptual Framework

Mental health continues to be a key focus in studies on quality of life and work-life balance. Previous research studies have addressed topics such as role conflict, workplace inequalities, impact of stress, job satisfaction, work performance, quality of life and effects of PMS on work-life balance. However, further research is required to explore the relationship between perceived stress and premenstrual emotional disturbances, and how premenstrual symptoms can be used as a central component to analyze stressors and identify coping strategies for maintaining work-life balance.

The Fig 1 depicts proposed framework for assessment of premenstrual symptoms. It shows that various biological, psychological, environmental, socio-economic and cultural factors influence the emotions and stressors of women, wherein, contribution of emotions and stressors to the content of dreams plays a vital role in understanding unresolved conflicts and emotion regulation, thereby facilitating alleviation of premenstrual symptoms and enhancing work-life balance.

Conceptual Framework for Assessment of Premenstrual Symptoms

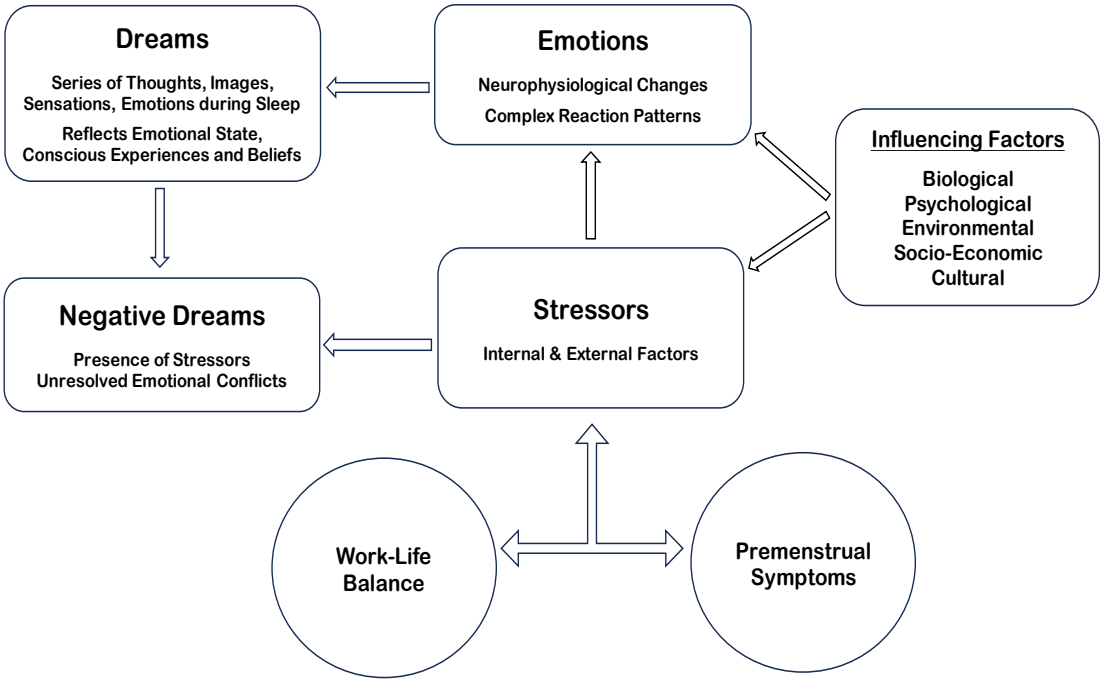

Fig 1

Suggestions & Conclusion

Research studies indicate that premenstrual symptoms affect women of different age-groups across various countries and ethnicity. Based on the proposed conceptual framework, empirical studies can be conducted among working women professionals across various sectors and include social, cultural, biological, premenstrual, health and psychological factors for extensive research. Inclusion of dreams as a component for analyzing emotions and stressors might pave way for understanding and alleviating premenstrual symptoms through a comprehensive approach. Orientation, training, wellness programs and societal awareness must be initiated at workplace focusing on the importance of emotional well-being and reproductive health and its effect on personal and professional life. Interventions and self-care measures must be developed based on in-depth assessment through biological, psychological and social angles. Fostering research in this aspect could provide valuable insights on effective management of premenstrual symptoms, and also facilitate workplace policies and social support system for women.

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