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Leveraging Artificial Intelligence to Enhance Employment Opportunities for Individuals with Sickle Cell Disease in Telangana and Andhra Pradesh

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Abstract

Sickle Cell Disease (SCD) is a global health challenge, especially in sub-Saharan Africa, the Middle East, and parts of India. In India, SCD is endemic among tribal populations, with over 20 million carriers and 1.5 million affected individuals, and states like Maharashtra, Gujrat, Odisha, and Chhattisgarh report high prevalence. Similarly, in Telangana, it is widespread among tribal communities, particularly in districts like Adilabad and Khammam, significantly impacting individuals' quality of life, and creating barriers in acquiring sustainable employment. This study aims to explore the specific employment challenges faced by individuals with SCD in the states of Telangana and Andhra Pradesh, focusing on factors such as literacy, physical limitations, pain crises, stigma, access to supportive technologies, and the lack of workplace accommodations. It will also assess how SCD influences career choices, job performance, and the ability to maintain steady employment. Additionally, it investigates the potential of Artificial Intelligence (AI)-driven solutions, such as remote work, flexible work arrangements, and AI-powered tools for task automation and health monitoring, to address these challenges. By examining the feasibility and effectiveness of AI in providing tailored support, the study aims to identify opportunities for improving employment prospects and job stability for individuals with SCD. The findings will provide actionable recommendations for employers, policymakers, and healthcare providers to create inclusive and supportive work environments, leveraging AI to enhance work-life balance, reduce health-related barriers, and empower individuals with SCD to pursue and retain fulfilling careers while managing their health.

Keywords: Sickle Cell Disease, Artificial Intelligence, Employment, Sustainability.

Introduction: The New Marketing Paradigm

Sickle Cell Disease (SCD), a genetic blood disorder is characterized by the production of abnormal haemoglobin, leading to the deformation of red blood cells into a sickle shape. This condition causes chronic pain, anaemia, fatigue, and a heightened risk of infections, significantly impacting the physical health and quality of life of affected individuals. In India, SCD is particularly prevalent among tribal populations, with States like Telangana and Andhra Pradesh reporting a high burden of the disease. For individuals with SCD in these regions, the challenges extend beyond health complications, affecting their ability to secure and sustain employment.

The Employment landscape for individuals with SCD is marked with distinct challenges. Physical limitations, including chronic pain and fatigue often restrict their ability to perform demanding or physically intensive tasks. The recurring pain crises, characteristic of SCD, may lead to frequent absenteeism or lower job performance due to hospitalization, further destabilizing job security. Additionally, societal stigma and a general lack of awareness about the condition further exacerbate the challenges, as individuals with SCD often face discrimination (reluctance to hire or retain employees with SCD, force them into low-paying workforce, low-skill jobs with limited advancement opportunities) and misunderstanding in the workplace. Compounding to these issues is the absence of adequate workplace accommodations such as flexibility in work hours, remote work options, ergonomic adjustments (seating, temperature etc.) and understanding of health needs specific to SCD. As a result, many individuals with SCD experience unemployment or underemployment, limiting their economic independence and overall well-being.

However, recent technological advancements, especially in artificial intelligence, opened new avenues for overcoming these challenges. AI-driven solutions hold significant potential to transform the employment landscape for individuals with SCD by providing tailored support and accommodations. For instance, remote work

platforms and flexible job arrangements can enable them to work from home, reducing physical strain thereby allowing them to manage their health more effectively. AI-powered tools for task automation can help ease workloads, while health monitoring applications can help individuals track their symptoms and seek timely medical intervention. These innovations not only improve productivity but also foster inclusive work environment for individuals with chronic health conditions.

This study explores the potential of AI to enhance employment opportunities for individuals with SCD in Telangana and Andhra Pradesh. The research aims to identify key barriers to employment faced by individuals with SCD, including physical, social, and systemic challenges. It also seeks to assess the impact of SCD on career choices, job performance, and the ability to maintain steady employment. Furthermore, the study evaluates the effectiveness of existing support services for SCD patients, identifying gaps and areas of improvement. By investigating AI-driven solutions, such as remote work, flexible job arrangements, and AI-powered health monitoring tools, the research aims to propose innovative strategies to accommodate the needs of individuals with SCD.

The ultimate goal of the study is to provide actionable recommendations for employers, healthcare providers, and policymakers to create more inclusive and supportive work environments. By leveraging AI technologies, the research seeks to reduce health-related employment barriers, enhance work-life balance, and empower individuals with SCD to achieve sustainable and fulfilling careers. The findings of the study have the potential to inform policies and practices that promote inclusivity, improve employment outcomes, and enhance the quality of life for individuals with SCD in Telangana, Andhra Pradesh, and beyond.

Objectives

The listed objectives set the stage for the research, explaining the context of SCD and its impact on employment, while also introducing the focus on AI-driven solutions.

1. Identify the primary barriers to employment faced by individuals with sickle cell disease (SCD) in Telangana and Andhra Pradesh.
2. Assess the impact of SCD on career choices, job performance, and the ability to maintain stable employment.
3. Evaluate the effectiveness of existing support services and resources for individuals with SCD seeking employment in these regions.
4. Investigate the potential of AI-driven solutions, such as remote work platforms, flexible work arrangements, and health monitoring tools, to address employment challenges for individuals with SCD.
5. Provide actionable recommendations for employers, policymakers, and healthcare providers to create inclusive work environments and improve employment outcomes for individuals with SCD through AI-driven strategies.

Research Questions and Hypotheses

The research questions and hypothesis highlight the multifaceted challenges faced by individuals with SCD in Telangana and Andhra Pradesh, particularly in the context of employment. The hypotheses suggest that while current support systems are inadequate, AI-driven solutions and inclusive policies have the potential to significantly improve employment outcomes for this population. By addressing societal, physical, and systemic barriers, these innovations can create more equitable and productive work environments for individuals with SCD.

1. What are the primary employment barriers faced by individuals with SCD in Telangana and Andhra Pradesh, and how do these barriers impact their career choices and job performance?
2. How effective are existing support services and resources in addressing the employment challenges of individuals with SCD?
3. What role can AI-driven solutions, such as remote work platforms and health monitoring tools, play in improving employment opportunities for individuals with SCD?
4. What policy changes and workplace accommodations are most needed to create inclusive work environments for individuals with SCD?

Hypothesis

- H1: Individuals with SCD in Telangana and Andhra Pradesh face significant employment barriers, including physical limitations, societal stigma, and inadequate workplace accommodations, leading to high rates of unemployment and underemployment.
- H2: Existing support services and resources for individuals with SCD are insufficient to address their employment challenges, highlighting the need for innovative, technology-driven solutions.
- H3: AI-driven solutions, such as remote work platforms, flexible job arrangements, and health monitoring tools, significantly improve employment opportunities and job retention for individuals with SCD.
- H4: Employers who adopt AI-driven accommodations and inclusive policies report higher productivity and job satisfaction among employees with SCD.

Research Methodology

This research adopts a mixed-methods approach, combining quantitative and qualitative methodologies to explore the employment challenges and opportunities for individuals with Sickle Cell Disease (SCD) in Telangana and Andhra Pradesh. The mixed-methods design is chosen to triangulate data, ensuring a comprehensive understanding of the barriers faced by individuals with SCD and to investigate the potential of AI-driven solutions. The quantitative component provides statistical insights into the prevalence of employment barriers and captures the perceptions of individuals with SCD on AI-driven solutions, while the qualitative component offers contextual depth through lived experiences and stakeholder perspectives.

For the quantitative component, a structured questionnaire is administered to a purposive sample of 53 individuals with SCD, ensuring representation across key demographics such as age, gender, income levels, and employment status. The sample included participants from three age groups: less than 18 years (30), 18-50 years (22), and 50 years or older (1), with a gender distribution of 38% males and 62% females. Participants were drawn from various districts across Andhra Pradesh and Telangana, with income categorized as low (below ₹250,000 – 72%), middle (₹250,000 – ₹500,000 – 23%), and high (above ₹500,000 – 6%). Employment status varied, with 53% employed, 19% unemployed, and 26% students, and 2% retired. The survey captured data on employment barriers, health-related impacts on job performance, and perceptions of AI-driven solutions such as remote work platforms, flexible hours, and task automation. Descriptive and inferential statistics were used to analyse the data, with statistical software like R and Python. This approach allowed for the identification of patterns and relationships between demographic variables and perceptions of AI-driven employment situations.

To complement the survey, the qualitative component involved semi-structured interviews with healthcare professionals, employers, and policymakers. These interviews provided deeper insights into existing employment policies, support systems, and the feasibility of AI-driven solutions. Interviews focused on themes such as workplace accommodations, policy gaps, and the potential of AI to address employment and health challenges faced by individuals with SCD. Thematic analysis was used to analyse the data aiding in identifying recurring patterns. This comprehensive methodology ensured reliability and validity in the findings, offering a nuanced understanding of the challenges and opportunities for individuals with SCD.

Ethical consideration was paramount. Informed consent was obtained from all participants. Data was anonymized to ensure confidentiality in tandem with the local data protection regulations. This study is not devoid of its inherent limitations, and authors acknowledge certain limitations, including regional focus and sample size, which may limit generalizability. However, the mixed-methods approach ensures robust insights into the local context, providing scope for future research studies.

By integrating quantitative and qualitative data, this methodology provides a comprehensive exploration of employment barriers faced by individuals with SCD and the potential of AI-driven solutions to address these challenges. The findings will offer actionable insights for employers, healthcare providers, and policy makers to create more inclusive work environments.

Literature Review

The literature on sickle cell anaemia (SCA) highlights the importance of tailored educational approaches and eHealth interventions in empowering patients to manage their health effectively. Plett et al. (2023) emphasize the role of personalized, culturally relevant educational tools in improving disease management and patient quality of life. Interactive resources tailored to the unique needs of SCA patients can enhance treatment adherence and raise awareness about the disease. This concept is extended by Badawy et al. (2018) , who conducted a systematic review of eHealth interventions, finding that digital tools significantly improved communication, self-management skills, and treatment adherence across all age groups. These findings underscore the potential of digital platforms to not only support health management but also facilitate remote employment opportunities for individuals with SCA, enhancing their overall quality of life.

While eHealth interventions show promise in improving health management, socio-economic challenges, remain a significant barrier for individuals with SCD. Lubeck et al. (2019) conducted longitudinal study analysing income disparities and reduced life expectancy among individuals with SCD, finding that these factors significantly contribute to economic instability. Their findings highlight the need for interventions that address both health and social inequalities, emphasizing flexible work solutions like remote jobs to promote financial independence without exacerbating healthcare-related costs. Similarly, Song et al. (2019) highlight the high healthcare costs associated with SCD, especially for patients with organ complications, which further impede economic independence and workforce participation. These studies underscore the need for work environments that accommodate the health challenges of SCD patients, suggesting that flexible, remote job options are crucial to reducing financial strain.

Further research by Snyder et al. (2022) and Issom et al. (2020) points to the gaps in healthcare access and engagement with mobile health applications among SCA patients. Snyder et al. (2022) highlight those patients in remote areas face challenges in accessing specialty care, reinforcing the need for digital health solutions that can connect patients with healthcare providers and employment opportunities. Issom et al. (2020) found that low engagement with mobile health apps was a significant barrier, emphasizing the need for user-friendly interfaces in future digital health tools, particularly those designed for remote work. The integration of AI in remote work solutions, such as adaptive scheduling tools and AI-powered health monitoring systems, is increasingly recognized as a key factor in addressing employment challenges for SCA patients.

Psychosocial factors also play a critical role in the employment stability of SCD patients. Studies by Harris et al. (2019) and Ware et al. (2017) show that mental health challenges, such as depression and anxiety, often exacerbate the difficulties SCA patients face in maintaining stable employment. These factors contribute to higher unemployment rates and employment instability. The need for flexible work environments that can adapt to health-related absences and mental health issues is highlighted as a key solution. Additionally, the role of digital forums and social support networks is explored in the work of Houwing et al. (2019), which emphasizes the importance of online communities in providing emotional support and fostering a sense of belonging, which can further enhance employment outcomes. Combining digital support networks with flexible employment models is suggested as an effective strategy for improving both mental health and job stability for SCD patients.

In addition to these health and employment-related challenges, studies on the transition from paediatric to adult care and the impact of chronic conditions like chronic kidney disease (CKD) further highlight the complex barriers to stable employment faced by SCA patients. Kanter and Kruse-Jarres (2013) address the difficulties associated with transitioning to adult care, which often includes increased healthcare costs and limited services, making it harder for patients to maintain steady employment. Similarly, research by Bukar et al. (2019) emphasizes that additional complications like CKD further hinder the ability of SCA patients to participate in the workforce. These findings suggest that AI-driven, flexible work solutions could play a critical role in supporting SCA patients through this transition, offering employment opportunities that accommodate fluctuating health conditions and help mitigate the impact of socio-economic and healthcare barriers.

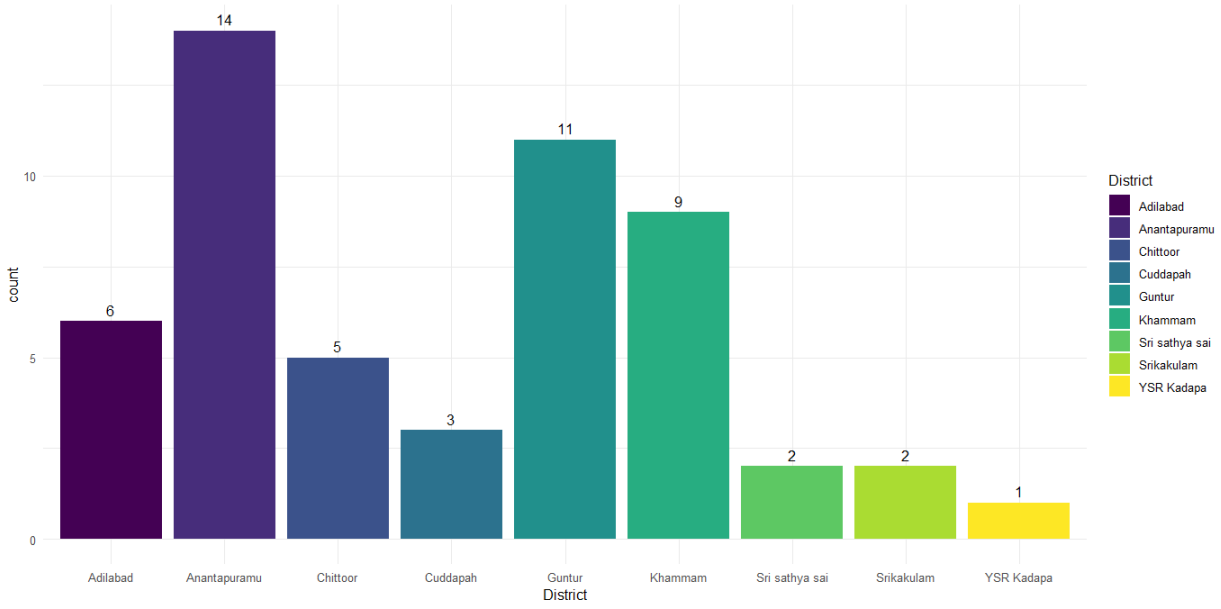
In summary, the literature highlights the multifaceted challenges faced by individuals with SCD, including health management, socio-economic barriers, and psychosocial factors. While eHealth interventions and flexible work solutions show promise, there is a critical need for research on AI-driven solutions tailored to the unique needs of SCA patients, particularly in undeserved regions. The study aims to address these gaps by exploring the potential of AI to enhance employment opportunities and improve quality of life for individuals with SCA.

Data Analysis and Findings

This section presents the analysis of data collected through both quantitative and qualitative methods to explore the employment challenges faced by individuals with Sickle Cell Disease in Telangana and Andhra Pradesh, as well as highlight the potential of AI-driven solutions to address these barriers. The quantitative data (gathered through structured questionnaires administered to 53 participants), and qualitative data (obtained through semi-structured interviews with healthcare professionals, employers, and policymakers) gathered and analysed provides deeper insights into existing support systems, policy gaps, and the feasibility of integrating AI in the workplace. These findings offer a comprehensive understanding of the challenges and opportunities for improving employment outcomes for individuals with SCD, while highlighting the transformational potential of AI-driven strategies and tools for inclusive workplace policies.

The demographic data collected from the primary survey provides a detailed overview of the participant's characteristics, which is essential for understanding the context of the study and interpreting its findings. The sample included 63% male participants and 37% female participants, reflecting a slightly higher representation of males. This gender distribution was intentional, as gender can influence access to resources and workplace experiences. A majority of the respondents (56.6%) were under 18 years old, followed by 41.5% aged 18-50 and 1.9% aged 50 or older. This age distribution ensures that the study captures how employment challenges and AI solutions are perceived across different life stages. Furthermore, income levels were predominantly low, with 62% earning below Rs.250000 annually, 32% in the middle income bracket (Rs.250000-Rs.500000), and only 6% in high income category (above Rs.500000). This income distribution highlights the socio-economic challenges faced by individuals with SCD, which may impact their employment opportunities and access to healthcare resources.

Figure 1: Distribution of Respondents by their Nativity



As depicted in figure 1, participants were drawn from various districts across Telangana and Andhra Pradesh, including Adilabad, Anantapuramu, Chittoor, Cuddapah, Guntur, Khammam, Sri Sathya Sai, Srikakulam, and YSR Kadapa. This regional distribution ensures diverse socio-economic and cultural representation, which is crucial for capturing varied contexts.

The demographic data reveals a diverse sample in terms of gender, age, income, employment status, and geographic location. High representation of younger participants and low-income individuals underscores the need for targeted interventions to address employment challenges and improve access to health resources. Regional diversity ensures findings are reflective of the broader population in Telangana and Andhra Pradesh. These demographic insights will guide the interpretation of data, ensuring that the analysis considers the unique needs and circumstances of different subgroups within the sample.

The chi-square test results presented in table 1 provide valuable insights into the relationship between specific barriers encountered by individuals with SCD when seeking employment and various demographic features including age, gender, employment status, income levels, and district-wise distribution.

Table 1
What specific barriers have you encountered when seeking employment due to SCD?

Demographic Indicators	Lack of understanding from employers	Limited job opportunities in your area	Physical limitations during job tasks	Stigma associated with the disease
Barriers Encountered vs. Age				
< 18 years	11	12	3	4
18-50 years	4	9	7	2
> 50 years	0	0	1	0
Chi-square Test p-value: 0.20117916010256395				
Barriers Encountered vs. Gender				
Male	7	9	11	6
Female	8	12	0	0
Chi-square Test p-value: 0.00163612971365108				
Barriers Encountered vs. Employment Status				
Student	4	5	3	2
Unemployed	9	1	0	0
Employed	2	15	7	4
Retired	0	0	1	0
Chi-square Test p-value: 0.0006181604253437994				
Barriers Encountered vs. Income Levels				
< 250,000	15	11	6	6
250,000 – 500,000	0	7	5	0
> 500,000	0	3	0	0
Chi-square Test p-value: 0.01002618573933224				
Barriers Encountered vs. District-wise				
Adilabad	4	0	0	2
Anantapuramu	7	3	4	0
Chittoor	2	0	3	0
Cuddapah	0	3	0	0
Guntur	0	4	3	4
Khammam	0	8	1	0
Sri Sathya Sai	0	2	0	0
Srikakulam	2	0	0	0
YSR Kadapa	0	1	0	0
Chi-square Test p-value: 0.0003700024838006381				

Chi-square Test p-value: 0.0003700024838006381

The chi-square test results reveal significant association between employment barriers faced by individuals with SCD and demographic features. Younger individuals face systemic barriers like limited opportunities, while older individuals encounter health-related challenges. Gender plays a critical role, with males experiencing health-related and stigma-based barriers, and females facing systemic and employer-related challenges. Unemployed individuals report more systemic barriers, while employed individuals face a mix of systemic and health-related challenges. Low-income individuals encounter systemic and employer-related barriers, while middle-income individuals face both systemic and health-related issues. Geographic location also influences barriers, with some

districts facing systemic challenges and others health-related or stigma-based barriers. These findings highlight the need for tailored interventions to address diverse employment challenges.

The chi-square test results in table 2 provide insights into how SCD influences job or career choices across different demographic features, including age, gender, district-wise distribution, employment status, and income levels.

Table 2
How has your condition influenced your choice of job or career path?

Demographic Indicators	Avoided certain industries due to health risks	Opted for less physically demanding jobs	Pursued flexible work arrangements
SCD_influence_on_choiceofjob vs. Age			
< 18 years	10	4	16
18-50 years	10	1	11
> 50 years	0	0	1
Chi-square test results: 0.6500351301898004			
SCD_influence_on_choiceofjob vs. Gender			
Male	12	1	7
Female	8	4	21
Chi-square test results: 0.0330124270172894			
SCD_influence_on_choiceofjob vs. Districts			
Adilabad	0	4	2
Anantapuramu	10	0	4
Chittoor	3	1	1
Cuddapah	0	0	3
Guntur	2	0	9
Khammam	3	0	66
Sri Sathya Sai	0	0	2
Srikakulam	2	0	0
YSR Kadapa	0	0	1
Chi-square test results: 7.666468841158548e-05			
SCD_influence_on_choiceofjob vs. Employment Status			
Student	3	4	7
Unemployed	9	0	1
Employed	8	1	19
Retired	0	0	1
Chi-square test results: 0.0012997893962780316			
SCD_influence_on_choiceofjob vs. Income Levels			
< 250,000	15	5	18
250,000 – 500,000	2	0	10
> 500,000	3	0	0
Chi-square test results: 0.03404935570515753			

The chi-square test results reveal that SCD significantly influences job and career choices, with gender, geographic location, employment status, and income levels playing key roles. Females and low-income individuals prioritize flexible work arrangements, while makes and unemployed individuals avoid certain industries due to health risks. Regional disparities, such as Khammam favouring flexible arrangements and Anantapuramu avoiding industries, highlight the need for location-specific interventions to address SCD-related employment challenges.

Table 3 **Have you ever been denied a job because of your SCD?**		
Demographic Indicators	**Yes**	**No**
JobDenial_DuetoSCD vs. Age		
< 18 years	8	22
18-50 years	5	17
> 50 years	0	1
Chi-square test results: 0.8034617030725458		
JobDenial_DuetoSCD vs. Gender		
Male	18	2
Female	22	11
Chi-square test results: 0.11309471876012146		
JobDenial_DuetoSCD vs. Districts		
Adilabad	0	6
Anantapuramu	3	11
Chittoor	0	5
Cuddapah	0	3
Guntur	6	5
Khammam	0	9
Sri Sathya Sai	2	0
Srikakulam	2	0
YSR Kadapa	0	1
Chi-square test results: 0.0012612832702812715		
JobDenial_DuetoSCD vs. Employment Status		
Student	2	12
Unemployed	2	8
Employed	9	19
Retired	0	1
Chi-square test results: 0.5506660275053121		
JobDenial_DuetoSCD vs. Income Levels		
< 250,000 (Low Income)	10	28
250,000 – 500,000 (Middle Income)	0	12
> 500,000 (High Income)	3	0
Chi-square test results: 0.0013628486998816718		

Data in table 3 reveals that job denial due to SCD is significantly linked to district and income levels, with higher denial rates in districts like Guntur and Sri Sathya Sai and among low-income individuals. High-income individuals also report some denial, indicating SCD-related discrimination spans income groups. However, no significant associations were found with age, gender, or employment status, suggesting these factors do not influence job denial. The findings highlight geographic and economic disparities in SCD-related discrimination, emphasizing the need for targeted interventions, such as awareness campaigns and anti-discrimination policies, in affected regions and income groups.

Table 4 **What types of jobs do you believe would be suitable for individuals with SCD?**			
Demographic Indicators	**Jobs that allow for frequent breaks**	**Part-time roles with flexible hours**	**Remote or telecommuting positions**
JobsSuitabletoSCDPatients vs. Age			
< 18 years	18	12	0
18-50 years	6	4	12

> 50 years	1	0	0
Chi-square test results: 0.00014513476835673964			
JobsSuitabletoSCDPatients vs. Gender			
Female	13	8	12
Male	12	8	0
Chi-square test results: 0.00901406001310405			
JobsSuitabletoSCDPatients vs. Districts			
Adilabad	2	4	0
Anantapuramu	7	0	7
Chittoor	1	1	3
Cuddapah	3	0	0
Guntur	6	5	0
Khammam	4	5	0
Sri Sathya Sai	2	0	0
Srikakulam	0	0	2
YSR Kadapa	0	1	0
Chi-square test results: 0.0009698343541960528			
JobsSuitabletoSCDPatients vs. Employment Status			
Student	7	4	3
Unemployed	7	1	2
Employed	10	11	7
Retired	1	0	0
Chi-square test results: 0.5101466096243665			
JobsSuitabletoSCDPatients vs. Income Levels			
< 250,000	24	9	5
250,000 – 500,000	1	7	4
> 500,000	0	0	3
Chi-square test results: 0.0002057350740792374			

The study examines suitable jobs for individuals with Sickle Cell Disease (SCD), focusing on roles allowing frequent breaks, part-time flexibility, or remote work. Table 4 presents significant associations with age, gender, district, and income levels ($p < 0.05$). Younger individuals (<18) prefer jobs with frequent breaks, while adults (18-50) favour remote work. Females show a preference for remote roles, unlike males. Geographic disparities exist, with districts like Anantapuramu favouring remote work. Low-income individuals prefer frequent breaks, while middle- and high-income groups lean toward flexible or remote roles. No significant link was found with employment status. These insights highlight the need for tailored job opportunities based on demographic factors.

Table 5
How do you feel about the financial support available for individuals with chronic diseases like SCD? (Scale: 1 = Very Poor, 5 = Excellent)

Demographic Indicators	Very Poor	Poor	Fair	Good	Excellent
Views on Financial Support for SCD Patients vs. Age					
< 18 years	6	2	16	3	3
18-50 years	0	9	10	3	0
> 50 years	0	0	1	0	0
Chi-square test results: 0.05570411707550272					
vs. Gender					
Female	6	9	12	6	0
Male	0	2	15	0	3
Chi-square test results: 0.0014367532032247025					
Views on Financial Support for SCD Patients vs. Districts					

Adilabad	4	0	0	2	0
Anantapuramu	0	7	7	0	0
Chittoor	0	0	4	1	0
Cuddapah	0	0	3	0	0
Guntur	2	0	6	3	0
Khammam	0	0	6	0	3
Sri Sathya Sai	0	2	0	0	0
Srikakulam	0	2	0	0	0
YSR Kadapa	0	0	1	0	0
Chi-square test results: 1.120236997010515e-05					
Views on Financial Support for SCD Patients vs. Employment Status					
Student	6	0	6	2	0
Unemployed	0	2	8	0	0
Employed	0	9	12	4	3
Retired	0	0	1	0	0
Chi-square test results: 0.004673716953793194					
Views on Financial Support for SCD Patients vs. Income Levels					
< 250,000 (Low Income)	6	4	19	6	3
250,000 – 500,000 (Middle Income)	0	4	8	0	0
> 500,000 (High Income)	0	3	0	0	0
Chi-square test results: 0.010542937900247792					

The study evaluates perceptions of financial support for individuals with Sickle Cell Disease (SCD). Table 5 shows significant associations with gender, district, employment status, and income levels ($p < 0.05$). Females and low-income individuals rated support as "Very Poor" or "Poor," while males and high-income groups were more critical. Districts like Adilabad and Anantapuramu reported dissatisfaction, whereas Khammam had mixed views. Employed individuals expressed varied opinions, while students and unemployed respondents were more negative. No significant link was found with age ($p = 0.056$). These findings highlight widespread dissatisfaction with financial support, particularly among females, low-income groups, and certain districts, underscoring the need for improved assistance programs.

Table 6
What would be your ideal working conditions to accommodate your health needs?

Demographic Indicators	A supportive and understanding work environment	Access to healthcare support at work	Flexible hours and remote work options
Views on Working Conditions & Health Needs vs. Age			
< 18 years	0	21	9
18-50 years	4	6	12
> 50 years	0	1	0
Chi-square test results: 0.012373446904584398			
Views on Working Conditions & Health Needs vs. Gender			
Female	3	14	16
Male	1	14	5
Chi-square test results: 0.14942165882543662			
Views on Working Conditions & Health Needs vs. Districts			

Adilabad	0	0	6
Anantapuramu	0	7	7
Chittoor	1	3	1
Cuddapah	3	0	0
Guntur	0	7	4
Khammam	0	6	3
Sri Sathya Sai	0	2	0
Srikakulam	0	2	0
YSR Kadapa	0	1	0
Chi-square test results: 2.8595107863832895e-06			
Views on Working Conditions & Health Needs vs. Employment Status			
Student	3	3	8
Unemployed	0	10	0
Employed	1	14	13
Retired	0	1	0
Chi-square test results: 0.006109075237883024			
Views on Working Conditions & Health Needs vs. Income Levels			
< 250,000	4	22	12
250,000 – 500,000	0	6	6
> 500,000	0	0	3
Chi-square test results: 0.13206456204346229			

Table 6 highlights preferred working conditions for health needs across demographics. Younger individuals (<18) prioritize healthcare access, while those aged 18-50 favour flexible hours. Females prefer flexibility, while males equally value healthcare access. District preferences vary, with some prioritizing flexibility and others healthcare or supportive environments. Students and employed individuals prefer flexible hours, while the unemployed prioritize healthcare access. Lower-income groups emphasize healthcare support, whereas higher-income groups prefer flexibility. Chi-square tests show significant associations for age, district, and employment status, but not for gender or income. These insights can guide tailored workplace policies to meet diverse health needs.

Table 7
How often do you experience pain crises that affect your ability to work?

Demographic Indicators	**Daily**	**Weekly**	**Monthly**	**Rarely**	**Never**
Frequency of Pain Crises Experience vs. Age					
< 18 years	9	11	10	0	0
18-50 years	5	12	2	3	0
> 50 years	0	0	0	1	0
Chi-square test results: 0.002662184881620958					
Frequency of Pain Crises Experience vs. Gender					
Female	14	15	0	4	0
Male	0	8	12	0	0
Chi-square test results: 9.391079785046506e-07					
Frequency of Pain Crises Experience vs. Districts					
Adilabad	0	6	0	0	0
Anantapuramu	3	4	7	0	0
Chittoor	0	5	0	0	0
Cuddapah	0	0	0	3	0
Guntur	9	0	2	0	0
Khammam	0	5	3	1	0
Sri Sathya Sai	0	2	0	0	0

Srikakulam	2	0	0	0	0
YSR Kadapa	0	1	0	0	0
Chi-square test results: 2.2069998117270407e-09					
Frequency of Pain Crises Experience vs. Employment Status					
Student	2	9	0	3	0
Unemployed	2	1	7	0	0
Employed	10	13	5	0	0
Retired	0	0	0	1	0
Chi-square test results: 1.7865618116774757e-05					
Frequency of Pain Crises Experience vs. Income Levels					
< 250,000 (Low Income)	11	14	10	3	0
250,000 – 500,000 (Middle Income)	0	9	2	1	0
> 500,000 (High Income)	3	0	0	0	0
Chi-square test results: 0.01883701324296818					

Table 7 examines the frequency of pain crises affecting work ability, categorized by demographic factors such as age, gender, district, employment status, and income levels. Younger individuals (< 18 years) report the highest daily and weekly pain crises, while those over 50 rarely experience them. Females report more frequent daily and weekly pain crises compared to males, who experience monthly crises. Districts like Guntur and Anantapuramu show higher frequencies of daily and weekly pain crises. Employed individuals report the most frequent pain crises, while retired individuals rarely experience them. Low-income individuals report the highest frequency of pain crises. Chi-square tests confirm these associations are statistically significant.

Table 8
Do you feel that your health condition is adequately understood by potential employers?

Demographic Indicators	No	Yes
Potential Employers Understanding about SCD vs. Age		
< 18 years	25	5
18-50 years	7	15
> 50 years	0	1
Chi-square test results: 0.00040306987930277435		
Potential Employers Understanding about SCD vs. Gender		
Female	14	19
Male	18	2
Chi-square test results:		
Potential Employers Understanding about SCD vs. Districts		
Adilabad	4	2
Anantapuramu	11	3
Chittoor	1	4
Cuddapah	0	3
Guntur	8	3
Khammam	8	1
Sri Sathya Sai	0	2
Srikakulam	0	2
YSR Kadapa	0	1
Chi-square test results: 0.006171723645035381		
Potential Employers Understanding about SCD vs. Employment Status		
Student	6	8
Unemployed	7	3
Employed	19	9

Retired	0	1
Chi-square test results: 0.22493279997246912		
Potential Employers Understanding about SCD vs. Income Levels		
< 250,000 (Low Income)	21	17
250,000 – 500,000 (Middle Income)	11	1
> 500,000 (High Income)	0	3
Chi-square test results: 0.007091490182336589		

Table 8 explores whether individuals feel their health condition (SCD) is adequately understood by potential employers, categorized by age, gender, district, employment status, and income levels. Younger individuals (< 18 years) and females are more likely to feel misunderstood, while males and older individuals (> 50 years) report better understanding. Districts like Anantapuramu and Khammam show lower levels of employer understanding, whereas Cuddapah and Sri Sathya Sai report higher understanding. Employed individuals feel less understood compared to students and retired individuals. Low-income individuals report the lowest levels of understanding, while high-income individuals feel more understood. Chi-square tests indicate significant associations for age, districts, and income levels, but not for employment status. Gender results are pending.

Table 9
What role does mental health play in your employment situation?

Demographic Indicators	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Role of Mental Health for Employment vs. Age					
< 18 years	8	0	10	8	4
18-50 years	3	6	4	8	1
> 50 years	0	0	0	0	1
Chi-square test results: 0.011425193728639161					
Role of Mental Health for Employment vs. Gender					
Female	9	6	7	6	5
Male	2	0	7	10	1
Chi-square test results: 0.020304969870667704					
Role of Mental Health for Employment vs. Districts					
Adilabad	4	0	0	2	0
Anantapuramu	3	4	7	0	0
Chittoor	0	0	3	1	1
Cuddapah	0	0	0	3	0
Guntur	2	0	3	2	4
Khammam	0	0	0	8	1
Sri Sathya Sai	2	0	0	0	0
Srikakulam	0	2	0	0	0
YSR Kadapa	0	0	1	0	0
Chi-square test results: 2.6858368048828903e-06					
Role of Mental Health for Employment vs. Employment Status					
Student	6	0	3	5	0
Unemployed	0	2	8	0	0
Employed	5	4	3	11	5
Retired	0	0	0	0	1
Chi-square test results: 0.00021507604526988888					
Role of Mental Health for Employment vs. Income Levels					
< 250,000	8	2	14	9	5
250,000 – 500,000	0	4	0	7	1

> 500,000	3	0	0	0	0
Chi-square test results: 0.00032517901642722735					

Table 9 explores how different demographic factors influence perceptions of the role of mental health in employment. Statistically significant associations were found between these perceptions and age, gender, district, employment status, and income level. Younger individuals, females, and those from certain districts were more likely to agree that mental health plays a significant role in employment. Similarly, employed individuals and those from lower-income households tended to agree more strongly on the importance of mental health in the workplace. These findings highlight the need for greater awareness and support for mental health in the workplace across various demographic groups.

Table 10 **Have you sought mental health support related to the challenges of living with SCD?**		
Demographic Indicators	**No**	**Yes**
Sought Mental Health Support for SCD vs. Age		
< 18 years	14	16
18-50 years	13	9
> 50 years	1	0
Chi-square test results: 0.4282214894187183		
Sought Mental Health Support for SCD vs. Gender		
Female	13	20
Male	15	5
Chi-square test results: 0.02553732187466632		
Sought Mental Health Support for SCD vs. Districts		
Adilabad	12	4
Anantapuramu	11	3
Chittoor	2	3
Cuddapah	3	0
Guntur	4	7
Khammam	6	3
Sri Sathya Sai	0	2
Srikakulam	0	2
YSR Kadapa	0	1
Chi-square test results: 0.05657380303695821		
Sought Mental Health Support for SCD vs. Employment Status		
Student	7	7
Unemployed	7	3
Employed	13	15
Retired	1	0
Chi-square test results:		
Sought Mental Health Support for SCD vs. Income Levels		
< 250,000 (Low Income)	16	22
250,000 – 500,000 (Middle Income)	12	0
> 500,000 (High Income)	0	3
Chi-square test results: 0.00036553981989560303		

Table 10 presents the desired changes in workplace policies for employees with Sickle Cell Disease (SCD) across different districts in India. Implementing flexible sick leave policies emerges as the most desired change, followed by offering remote work options. While providing health-related accommodations and mental health support are considered important, their prioritization varies across districts. This suggests a strong need for flexible work arrangements and supportive policies to accommodate the needs of employees with SCD in the workplace.

Table 11 **What community resources or support groups have you accessed for assistance with employment?**		
Demographic Indicators	**Local non-profits focused on chronic illness support**	**Online forums or social media groups for patients**
Assistance Sought from Community resources & Support Groups for Employment vs. Age		
< 18 years	16	14
18-50 years	11	11
> 50 years	0	1
Chi-square test results: 0.5726783010855621		
Assistance Sought from Community resources & Support Groups for Employment vs. Gender		
Female	14	19
Male	13	7
Chi-square test results: 0.19013236438210368		
Assistance Sought from Community resources & Support Groups for Employment vs. Districts		
Adilabad	4	2
Anantapuramu	7	7
Chittoor	1	4
Cuddapah	0	3
Guntur	4	7
Khammam	8	1
Sri Sathya Sai	2	0
Srikakulam	0	2
YSR Kadapa	1	0
Chi-square test results: 0.033201731171012897		
Assistance Sought from Community resources & Support Groups for Employment vs. Employment Status		
Student	6	8
Unemployed	1	9
Employed	20	8
Retired	0	1
Chi-square test results: 0.005055978504860135		
Assistance Sought from Community resources & Support Groups for Employment vs. Income Levels		
< 250,000	13	25
250,000 – 500,000	11	1
> 500,000	3	0
Chi-square test results: 0.0005236646840813991		

Table 11 explores the association between various demographic factors and the use of community resources or support groups for employment assistance among individuals with Sickle Cell Disease (SCD). Statistically significant associations were found with employment status and income level. Unemployed individuals and those from lower-income households were more likely to have accessed these resources. Gender and district showed some association, while age did not. These findings suggest that socioeconomic factors may influence the utilization of community resources for employment support among individuals with SCD.

Table 12 How effective do you think AI-powered support groups and online communities will be in finding job opportunities?					
Demographic Indicators	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Effectiveness of AI in Finding Job Opportunities vs. Age					
< 18 years	12	0	15	0	3
18-50 years	3	4	8	6	1
> 50 years	0	0	0	1	0
Chi-square test results: 0.00270841392243334					
Effectiveness of AI in Finding Job Opportunities vs. Gender					
Female	13	4	11	4	1
Male	2	0	12	3	3
Chi-square test results: 0.030041819936390986					
Effectiveness of AI in Finding Job Opportunities vs. Districts					
Adilabad	4	0	0	2	0
Anantapuramu	3	4	7	0	0
Chittoor	0	0	3	2	0
Cuddapah	0	0	3	0	0
Guntur	6	0	3	2	0
Khammam	0	0	5	1	3
Sri Sathya Sai	2	0	0	0	0
Srikakulam	0	0	2	0	0
YSR Kadapa	0	0	0	0	1
Chi-square test results: 0.0004115487001333225					
Effectiveness of AI in Finding Job Opportunities vs. Employment Status					
Student	6	0	6	2	0
Unemployed	0	0	9	0	1
Employed	9	4	8	4	3
Retired	0	0	0	1	0
Chi-square test results: 0.02465638322934283					
Effectiveness of AI in Finding Job Opportunities vs. Income Levels					
< 250,000	12	0	18	4	4
250,000 – 500,000	0	4	5	3	0
> 500,000	3	0	0	0	0
Chi-square test results: 0.0005678406296049528					

The chi-square analysis presented in table 13 reveals significant associations between perceptions of AI's effectiveness in finding job opportunities and several demographic factors. Younger individuals, males, and individuals from lower-income households tend to perceive AI more favourably in job searching compared to older individuals, females, and those from higher-income households. Additionally, perceptions vary across districts, suggesting regional differences in attitudes towards AI-powered job search tools.

Table 13 What kind of training or skills development do you believe would make you most employable?		
Demographic Indicators	**Job-specific training programs**	**Soft skills development workshops**
Training/ Skills Development Enhancing Employability Opportunities vs. Age		
< 18 years	11	19
18-50 years	9	13

> 50 years	1	0
Chi-square test results: 0.4385414055605509		
Training/ Skills Development Enhancing Employability Opportunities vs. Gender		
Female	11	22
Male	10	10
Chi-square test results: 0.8331738140331896		
Training/ Skills Development Enhancing Employability Opportunities vs. Districts		
Adilabad	4	2
Anantapuramu	3	11
Chittoor	1	4
Cuddapah	3	0
Guntur	2	9
Khammam	6	3
Sri Sathya Sai	2	0
Srikakulam	0	2
YSR Kadapa	0	1
Chi-square test results: 0.014703597424690984		
Training/ Skills Development Enhancing Employability Opportunities vs. Employment Status		
Student	7	7
Unemployed	0	10
Employed	13	15
Retired	1	0
Chi-square test results: 0.026042354379770004		
Training/ Skills Development Enhancing Employability Opportunities vs. Income Levels		
< 250,000	10	28
250,000 – 500,000	8	4
> 500,000	3	0
Chi-square test results: 0.003980419738381178		

Table 13 reveals significant associations between perceived training needs for employability and several demographic factors. Unemployed individuals and those from lower-income households strongly favour soft skills development workshops compared to other groups. District-level variations also exist, with some districts placing greater emphasis on soft skills development. While age and gender show less pronounced associations, these findings highlight the importance of both job-specific training and soft skills development in enhancing employability perceptions across different demographic groups.

Table 14
Do you believe there is sufficient awareness about SCD among employers in your area?

Demographic Indicators	No	Yes
Awareness of Employers in your area - SCD vs. Age		
< 18 years	9	21
18-50 years	4	18
> 50 years	1	0
Chi-square test results: 0.15325541802217088		
Awareness of Employers in your area - SCD vs. Age vs. Gender		
Female	4	29

Male	10	10
Chi-square test results: 0.006718467880184836		
Awareness of Employers in your area - SCD vs. Age vs. Districts		
Adilabad	2	4
Anantapuramu	7	7
Chittoor	2	3
Cuddapah	0	3
Guntur	0	11
Khammam	1	8
Sri Sathya Sai	2	0
Srikakulam	0	2
YSR Kadapa	0	1
Chi-square test results: 0.026319335125750694		
Awareness of Employers in your area - SCD vs. Age vs. Employment Status		
Student	2	12
Unemployed	7	3
Employed	4	24
Retired	1	0
Chi-square test results: 0.0012833592756955569		
Awareness of Employers in your area - SCD vs. Age vs. Income Levels		
< 250,000 (Low Income)	13	25
250,000 – 500,000 (Middle Income)	1	11
> 500,000 (High Income)	0	3
Chi-square test results: 0.11745448039981198		

The chi-square analysis in table 14 reveals significant associations between perceived awareness of SCD among employers and several demographic factors. Females, employed individuals, and those from lower-income households are significantly more likely to perceive a lack of employer awareness about SCD compared to males, unemployed individuals, and those from higher-income households. Additionally, perceptions vary significantly across districts, suggesting regional differences in awareness levels.

Table 15
What educational initiatives do you think could improve job opportunities for individuals with SCD?

Demographic Indicators	Public awareness campaigns about SCD	Workshops for employers on chronic illnesses
Educational Initiatives Required for Improved Job Opportunities vs. Age		
< 18 years	14	16
18-50 years	8	14
> 50 years	0	1
Chi-square test results: 0.5277527698684605		
Educational Initiatives Required for Improved Job Opportunities vs. Gender		
Female	7	26
Male	15	5
Chi-square test results: 0.0003644303054698563		
Educational Initiatives Required for Improved Job Opportunities vs. Districts		
Adilabad	2	4
Anantapuramu	11	3
Chittoor	2	3
Cuddapah	0	3
Guntur	0	11

Khammam	5	4
Sri Sathya Sai	2	0
Srikakulam	0	2
YSR Kadapa	0	1
Chi-square test results: 0.0025683104534380647		
Educational Initiatives Required for Improved Job Opportunities vs. Employment Status		
Student	2	12
Unemployed	7	3
Employed	13	15
Retired	0	1
Chi-square test results: 0.0350219414578982		
Educational Initiatives Required for Improved Job Opportunities vs. Income Levels		
< 250,000	13	25
250,000 – 500,000	9	3
> 500,000	0	3
Chi-square test results: 0.014218212092810115		

Chi-square results in table 15 reveal significant associations between perceived educational initiatives for improving job opportunities for individuals with SCD and several demographic factors. Females, unemployed individuals, and those from lower-income households strongly favour soft skills development workshops compared to males, employed individuals, and those from higher-income households who prioritize public awareness campaigns about SCD. Additionally, perceptions vary significantly across districts, suggesting regional differences in awareness and needs related to employment support for individuals with SCD.

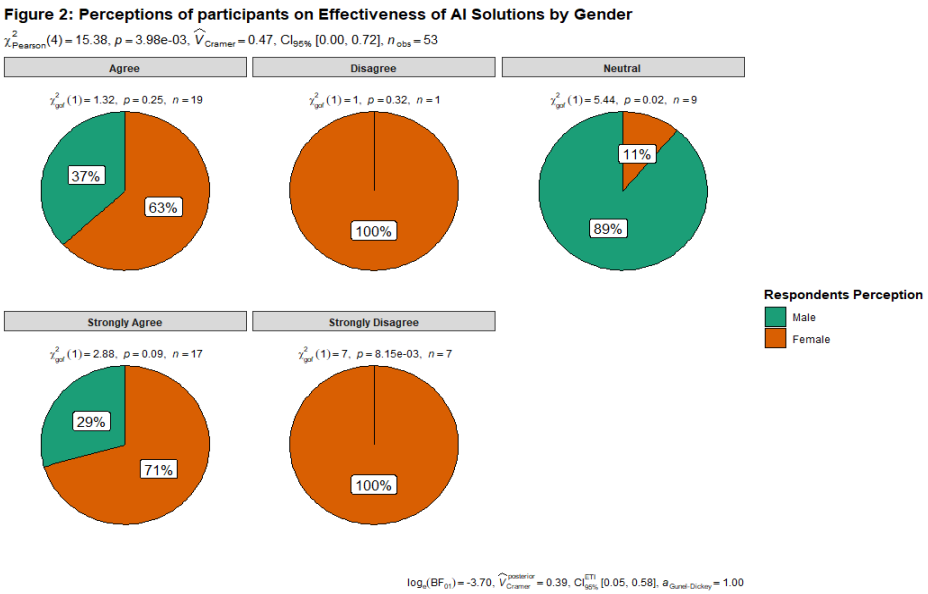


Figure 2 highlights a significant gender disparity in perceptions of AI effectiveness, with males generally expressing more positive views than females. Overall, the data suggests that females have stronger opinions on the effectiveness of AI solutions, both positively (agree, strongly agree) and negatively (disagree, strongly disagree), compared to males. The chi-square test results highlight significant differences in some categories, reflecting varying perceptions between genders.

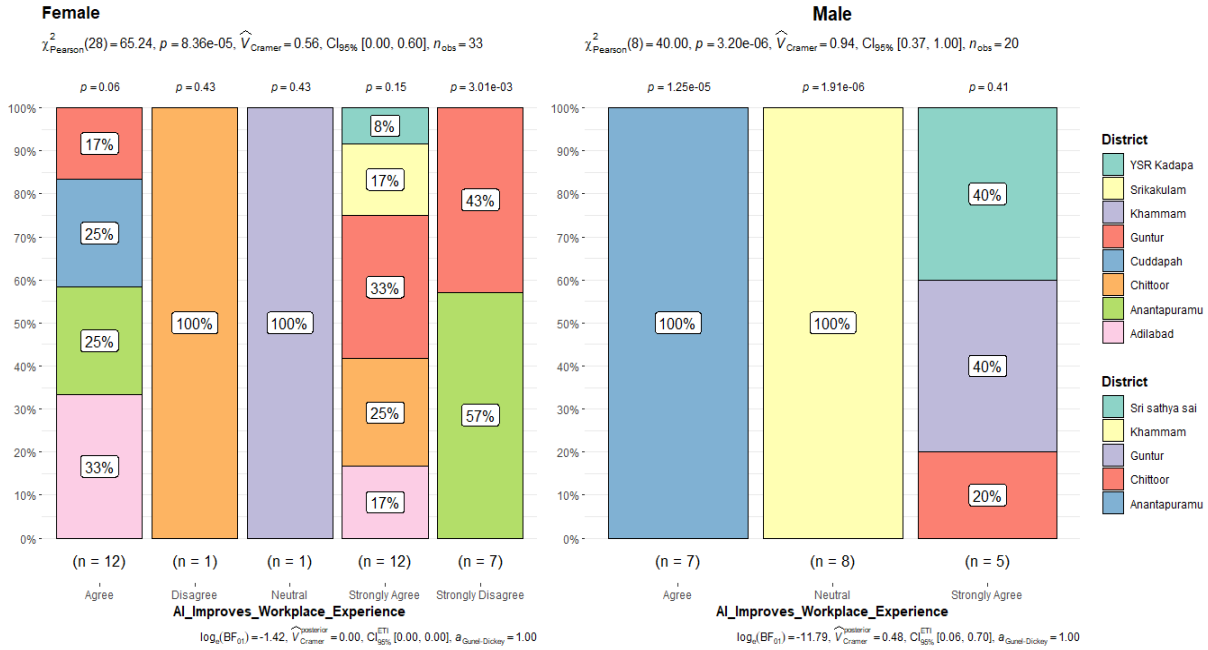
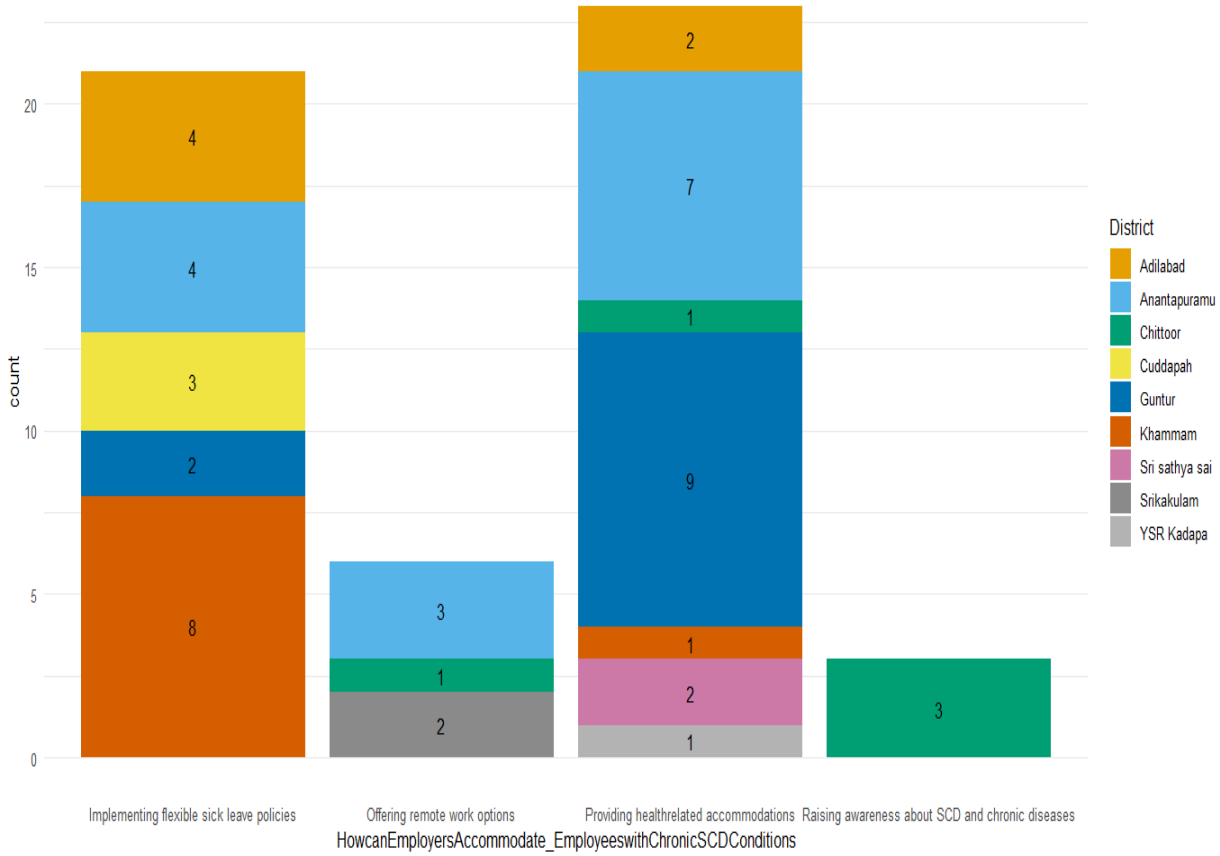


Figure 3: Perceptions of participants on Effectiveness of AI solutions across districts

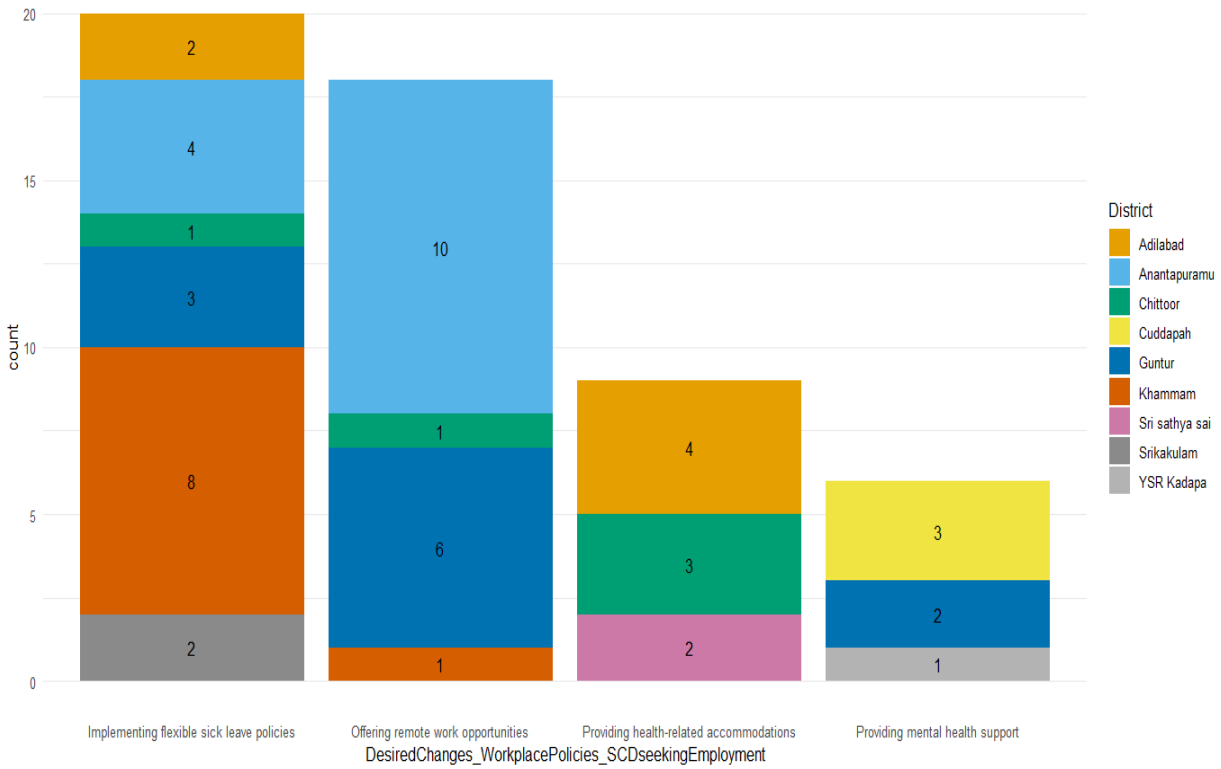
Figure 3 compares responses from females and males across different districts, with categories including “Agree, Disagree, Neutral, Strongly agree, and Strongly Disagree". It highlights a significant gender disparity in perceptions regarding the effectiveness of AI in improving workplace experience, with males generally expressing more positive views than females. Additionally, the data suggests that there are variations in these perceptions across different districts, indicating potential regional or socio-economic factors influencing these views.

Figure 4: District-wise perception on how employers can accommodate SCD employees



The bar chart in figure 4 illustrates the district-wise perception of how employers can accommodate employees with Sickle Cell Disease (SCD). The responses indicate that "Implementing flexible sick leave policies" is perceived as the most common and effective accommodation across districts. "Offering remote work options" is also considered a significant accommodation strategy, particularly in districts like Guntur and Khammam. "Providing health-related accommodations" and "Raising awareness about SCD and chronic diseases" are perceived as less common or less effective accommodations across most districts.

Figure 5: District-wise perception regarding desired changes in workplace policies for employees with SCD



This bar chart in figure 5 illustrates the desired changes in workplace policies for employees with Sickle Cell Disease (SCD) as perceived by individuals across different districts in India. The most commonly desired change across all districts is the implementation of flexible sick leave policies. Offering remote work options is also seen as a significant need, particularly in certain districts. Providing health-related accommodations and mental health support are considered important but are less frequently desired compared to flexible leave and remote work options. These findings suggest that a combination of flexible work arrangements and supportive workplace policies is crucial for accommodating employees with SCD and improving their overall well-being.

The results of predicting employment status based on the combination of demographic and health-related factors, specifically the barriers faced due to sickle cell disease (SCD) show that different machine learning models provide varying levels of accuracy and interpretability. Various machine learning techniques including Logistic Regression, Decision Trees, Random Forest, Support Vector Machines, and K-Nearest Neighbours were utilized. The models performance results indicate substantial improvements with hyper-parameter tuning methods like GridSearchCV and RandomizedSearchCV compared to the basic models.

Accuracy of the Machine Learning Models in %				
		Basic Models	**GridSearchCV**	**RandomizedSearchCV**
0	Logistic Regression	81.82	90.83	90.83
1	Decision Tree	81.82	85.83	85.83
2	Random Forest	81.82	85.83	83.61
3	Support Vector Machine	81.82	85.83	85.83

4	K-Nearest Neighbours	54.55	85.83	85.83

For Logistic Regression, the accuracy increased from 81.82% to 90.83% with both tuning methods. Similarly, Decision Tree accuracy rose from 81.82% to 85.83% with tuning the hyper-parameters. Random Forest showed a slight improvement, with RandomizedSearchCV yielding an accuracy of 83.61%, slightly below the 85.83% accuracy achieved with GridSearchCV. Both Support Vector Machine (SVM) and K-Nearest Neighbours (KNN) reached 85.83% accuracy after tuning, a significant jump from their initial accuracies of 81.82% and 54.55% respectively. Hyper-parameter tuning consistently enhanced the performance of all models, demonstrating the importance of optimizing model parameters for complex tasks like predicting employment status.

A machine learning models is developed to classify career goals into specific categories such as Creative Career, Tech Field, Health Advocacy, and Remote Work. Using a dataset of 53 career goals paired with their respective labels, the study employs the Naïve Bayes algorithm after converting textual data into numerical vectors through the TfidfVectorizer. The model achieves an accuracy of 93.75%, demonstrating strong performance. Precision and recall scores are particularly high for categories like “Creative Career”, “Health Advocacy”, and “Tech Field”, reflecting the models ability to accurately classify these goals. However, the models struggles with the Work-life Balance” category, receiving low performance due to its under-representation in the dataset. The classification report highlights the models overall effectiveness, though it suggests potential areas for improvement in handling rare categories.

The KMeans clustering algorithm applied to the career-related text data successfully separated the dataset into two distinct clusters. Cluster 0, containing 30 entries, predominantly represents general career paths, including flexible work options, roles in technology, creative industries, and more accessible job markets. On the other hand, cluster 1, with 23 entries, focuses on specialized career trajectories in fields like health advocacy, leadership, and healthcare, which require specific expertise or address societal needs. This distinction between the clusters indicates a clear division between general career opportunities and those targeting niche professions. Cluster 0 is best interpreted as representing “General career paths” while Cluster 1 can be categorized as “Specialized career paths”. These findings provide valuable insights for individuals exploring career opportunities, helping them navigate either broad or specialized job sectors. Further analysis of the keywords in each cluster could refine these interpretations.

Sentiment Analysis conducted on the list of career goals using TextBlob revealed a diverse range of sentiment polarity across the goals. The sentiment polarity scored varied from -1 (highly negative) to +1 (highly positive), with a score of 0 indicating neutral sentiment. The analysis showed that most career goals had a slightly positive sentiment, with scores typically ranging from 0.13 to 0.17, suggesting that the goals were framed in a neutral or mildly optimistic tone. However, certain career goals, particularly those related to fields like technology, health advocacy, and leadership roles, exhibited a neutral sentiment with scores around 0.00, implying that these goals lacked strong emotional expression and were likely framed in a more matter-of-fact or balanced manner. In contrast, career goals focusing on flexible work environments or part-time roles received higher positive sentiment scores, indicating a more optimistic or favourable outlook towards these work arrangements. Overall, the results indicate that most career goals are framed in a neutral or slightly positive manner, with only a few expressing strong negativity or positivity. This analysis provides insight into how the framing of career goals may influence perceptions and emotions related to career choices, particularly with respect to aspects like work flexibility, creative opportunities, and professional growth.

Recommendations and Suggestions

The study provides valuable insights into the employment challenges faced by individuals with sickle cell disease (SCD) across diverse demographic and geographic contexts in Telangana and Andhra Pradesh. The findings highlight significant associations between employment barriers and demographic factors such as age, gender, income, and geographic location. Younger individuals face systemic barriers like limited opportunities, while older individuals encounter health-related challenges. Gender disparities are evident, with males experiencing health-related and stigma-based barriers, and females facing systemic and employer-related challenges. Geographic location further influences the nature of barriers, with some districts reporting systemic challenges and others health-related or stigma-based issues. These findings underscore the need for tailored interventions, such as awareness campaigns, anti-discrimination policies, and location-specific employment support programs,

to address the unique challenges faced by different subgroups.

The study also reveals that SCD significantly influences job and career choices, with preferences for flexible work arrangements, remote work, and roles accommodating frequent breaks varying across demographics. Females and low-income individuals prioritize flexibility, while males and unemployed, individuals avoid certain industries due to health risks. Regional disparities, such as Khammam favouring flexible arrangements, and Anantapuramu avoiding specific industries, highlight the need for targeted interventions. Additionally, dissatisfaction with financial support and workplace policies is widespread, particularly among females, low-income groups, and certain districts. Implementing flexible sick leave policies, offering remote work options, and providing health-related accommodations are identified as key desired changes. These findings emphasize the importance of developing inclusive workplace policies and support systems to improve the employment outcomes and well-being of individuals with SCD.

Furthermore, the study demonstrates the potential of machine learning models in predicting employment status and classifying career goals, with hyper-parameter tuning significantly enhancing model accuracy. Sentiment analysis of career goals reveals a generally neutral to slightly positive tone, with flexible work arrangements viewed more favourably. These insights can guide policymakers, employers, and NGOs in designing targeted interventions, such as soft skills development workshops, public awareness campaigns, and AI-powered job search tools, to enhance employability and address the diverse needs of individuals with SCD. Overall, the study calls for a multi-faceted approach to address the complex interplay of health, socio-economic, and geographic factors influencing employment outcomes for this population.