RESEARCH PAPER

Spectacle Non-Compliance Among Factory Workers Undergoing Health Checkup in a Tertiary Care Centre

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ABSTRACT

Background:
Uncorrected refractive errors are a leading cause of preventable visual impairment and occupational inefficiency globally. Despite the availability of effective correction with spectacles, non-compliance remains a significant public health concern, particularly among industrial workers whose visual demands are critical for occupational safety.

Objective:
To determine the prevalence and associated factors of spectacle non-compliance among factory workers undergoing health checkup at a tertiary care centre.

Methods:
A hospital-based cross-sectional study was conducted among 95 factory workers aged 35–45 years attending a health checkup camp. Data on socio-demographics, refractive status, spectacle compliance, and reasons for non-compliance were collected using a structured proforma. Bivariate analysis was performed, and statistical significance was assessed using chi-square/Fisher's exact test.

Results:
The mean age was 40.1 (SD 3.3) years with near-equal gender distribution. The prevalence of spectacle non-compliance was 33.7% (n=32). Among non-compliant workers, personal causes (37.5%) were the most common reason, followed by spectacle-related issues (34.4%) and financial barriers (28.1%). Rural residence (p=0.006), lower educational attainment (p=0.025), and myopic refractive error (p=0.047) were significantly associated with non-compliance. Age, gender, and magnitude of refractive error were not significant determinants (p>0.05).

Conclusion:
Approximately one-third of factory workers were non-compliant with prescribed spectacle wear. Targeted health education for rural and less-educated workers, combined with improved spectacle dispensing practices and financial support, may enhance compliance and occupational safety.

Keywords: Spectacle compliance; refractive error; factory workers; occupational health; cross-sectional study

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INTRODUCTION

Uncorrected refractory error (URE) is the leading cause of moderate to severe visual impairment worldwide, affecting an estimated 157 million people globally.[1,2]

The World Health Organization (WHO) estimates that at least 2.2 billion people globally have near or distance vision impairment, of which at least 1 billion cases could have been prevented or remain unaddressed. Refractory errors and

cataracts together account for over 70% of global vision impairment.[3]

The economic burden of URE is substantial. Vision impairment is estimated to cost the global economy USD 411 billion annually in lost productivity.[3]

In India, the National Programme for Control of Blindness (NPCB) has identified refractory errors as the leading cause of visual impairment among the working-age population. Uncorrected refractory errors reduce workplace productivity and increase the risk of occupational injuries, particularly in industries that demand precise visual acuity.[4,5]

Spectacles remain the most accessible, cost-effective, and widely used form of refractive correction. However, the benefits of spectacle correction can only be realised through consistent and regular use. Non-compliance with spectacle wear has been documented in various population studies, with rates varying from 20% to over 60% depending on the population and setting studied.[6-8]

Factors influencing spectacle compliance include demographic variables such as age, gender, education, and socioeconomic status; clinical factors including the type and magnitude of refractory error; and personal, financial, and spectacle-related barriers.[6,7,9]

While most studies on spectacle compliance have been conducted in paediatric and school-based populations, data on compliance among adult factory workers in India remain sparse. Factory workers represent a vision-dependent workforce where uncorrected refractory error has direct implications for occupational safety, productivity, and economic output.[10,11]

This study was designed to determine the prevalence and determinants of spectacle non-compliance among factory workers attending a health checkup camp at a tertiary care centre, and to identify modifiable factors that may inform targeted interventions.

METHODS

Study Design and Setting

This was a hospital-based, cross-sectional observational study conducted among factory workers undergoing a routine health checkup at a tertiary care centre. The study was carried out during a factory health camp organised as part of occupational health services.

Study Population and Eligibility

The study population comprised factory workers aged 35 to 45 years who attended the health checkup camp during the study period. All participants with a pre-existing prescription for refractive correction (spectacles) were eligible for inclusion. Workers who declined to participate or who had undergone refractive surgery were excluded from the study.

A total of 95 eligible factory workers were enrolled in the study. The sample comprised consecutive attendees who met the inclusion criteria during the camp period.

Study Variables

The following data were collected using a structured, pre-tested proforma:

- Socio-demographic variables: age (years), gender (male/female), place of residence (urban/rural), and educational status (secondary, higher secondary, graduate/diploma).
- Clinical variables: refractive error type (myopia, hyperopia, astigmatism) and spherical equivalent (SE) in dioptres (D) for each eye.
- Outcome variable: spectacle compliance status (compliant/non-compliant) based on self-reported consistent use of prescribed spectacles during work and daily activities.
- Reasons for non-compliance (where applicable): categorised as personal causes (e.g., forgetfulness, lack of perceived need), financial causes (e.g., cost of replacement or repair), or spectacle-related causes (e.g., discomfort, broken frames, poor aesthetics).

Data Collection and Measurement

Data were collected by trained research personnel during the health checkup camp using a structured questionnaire. Socio-demographic information was recorded through direct interview. Refractive status was assessed through review of existing prescriptions and confirmed by case-sheet records. The spherical equivalent was calculated as sphere + half-cylinder for each eye.

Spectacle compliance was assessed through a direct question regarding regular use of prescribed spectacles during occupational and daily activities. Non-compliant individuals were asked to self-report the primary reason for non-compliance from the predefined categories. The responses were recorded by the interviewer to minimise recall bias.

Addressing Potential Sources of Bias

As a cross-sectional study, several potential sources of bias were considered. Recall bias was minimised by using a structured questionnaire administered during a face-to-face interview. Information bias was reduced by using standardised data collection forms and training the interviewers. Since compliance was self-reported, social desirability bias may have led to an overestimation of compliance rates. This limitation is acknowledged in the discussion. Efforts were made to ensure confidentiality and create a non-judgemental environment to encourage honest responses.

Sample Size Justification

The sample size of 95 was determined by the availability of eligible participants during the health camp period. All consecutive attendees

meeting the eligibility criteria were enrolled, constituting a census-based approach within the camp setting. While a formal a priori sample size calculation was not performed, this sample is comparable to cross-sectional studies of similar scope in the Indian literature on spectacle compliance.[6,7]

Handling of Quantitative Variables

Age and spherical equivalent (SE) were treated as continuous variables and summarised using mean and standard deviation (SD). Range was reported where appropriate. Categorical variables (gender, residence, education, refractory error type, compliance status, and reasons for non-compliance) were expressed as frequencies and percentages.

Statistical Methods

Descriptive statistics were computed for all study variables. Continuous variables were expressed as mean (SD) and categorical variables as frequencies (percentages). Bivariate analysis was performed to compare compliant and non-compliant groups across socio-demographic and clinical characteristics. For categorical variables, chi-square test or Fisher's exact test (where expected cell counts were <5) was used. For continuous variables, the comparison of means was assessed using the Student's t-test. A p-value of <0.05 was considered statistically significant. All analyses were performed using jamovi statistical software (version 2.x).

RESULTS

Study Participants

A total of 95 factory workers aged 35 to 45 years who met the eligibility criteria were enrolled in the study. All participants completed the data collection process. The socio-demographic and clinical profiles are summarised in Table 1.

Socio-demographic Characteristics

The mean age of the participants was 40.1 years (SD 3.3; range: 35-45). The gender distribution was nearly equal, with 51.6% (n=49) males and 48.4% (n=46) females. The majority of participants resided in urban areas (64.2%, n=61), while 35.8% (n=34) were from rural settings. Regarding educational status, 40.0% (n=38) had completed graduate or diploma-level education, 35.8% (n=34) had higher secondary education, and 24.2% (n=23) had secondary education (Table 1).

Table 1. Socio-demographic and clinical profile of the study population (N = 95)

Characteristic	Category	Overall (N = 95)
Age (years)	Mean (SD)	40.1 (3.3)
	Range	35.0 - 45.0
Gender	Male	49 (51.6%)
	Female	46 (48.4%)
Residence	Urban	61 (64.2%)
	Rural	34 (35.8%)
Education	Graduate/Diploma	38 (40.0%)
	Higher Secondary	34 (35.8%)
	Secondary	23 (24.2%)
SE Right (D)	Mean (SD)	2.1 (0.5)
	Range	1.2 - 2.8
SE Left (D)	Mean (SD)	2.0 (0.5)
	Range	1.2 - 2.8
Type of error	Myopia	37 (38.9%)
	Hyperopia	36 (37.9%)
	Astigmatism	22 (23.2%)
Compliance	Yes	63 (66.3%)
	No	32 (33.7%)

Pattern of Refractive Errors

The physiological assessment of the cohort revealed a mean spherical equivalent (SE) of 2.1 D (SD 0.5) in the right eye and 2.0 D (SD 0.5) in the left eye, with ranges of 1.2 to 2.8 D. The distribution of refractive errors was relatively even: myopia was present in 38.9% (n=37), hyperopia in 37.9% (n=36), and astigmatism in 23.2% (n=22) of participants (Table 1).

Prevalence and Reasons for Non-compliance

The overall prevalence of spectacle non-compliance was 33.7% (n=32), while 66.3% (n=63) of the workers were compliant with their prescribed spectacle wear. Among the 32 non-compliant workers, the primary reasons cited were: personal causes (e.g., forgetfulness, lack of perceived need) in 12 (37.5%), spectacle-related causes (e.g., discomfort, broken frames, poor aesthetic appeal) in 11 (34.4%), and financial causes (e.g., cost of replacement or repair) in 9 (28.1%) participants (Table 2).

Table 2. Reasons for spectacle non-compliance among non-compliant workers (n = 32)

Reason for Non-	n	%

compliance		
Personal causes	12	37.5
Spectacle-related causes	11	34.4
Financial causes	9	28.1
Total	32	100.0

Factors Associated with Spectacle Non-compliance

Bivariate analysis revealed several significant determinants of spectacle non-compliance (Table 3):

Residence (p = 0.006): Workers from rural areas demonstrated significantly higher rates of non-compliance (56.2%, n = 18/34) compared to their urban counterparts (23.0%, n = 14/61), suggesting that access barriers and environmental factors in rural settings may hinder adherence to spectacle use.

Educational status (p = 0.025): Non-compliance was highest among workers with secondary education only (56.5%, n = 13/23), intermediate among those with higher secondary education (29.4%, n = 10/34), and lowest among graduates/diploma holders (23.7%, n = 9/38), indicating that higher educational attainment and associated health literacy correlate with better compliance.

Type of refractory error (p = 0.047): Workers with myopia demonstrated the highest rate of non-compliance (48.6%, n = 18/37), while those with astigmatism were the most compliant (22.7%, n = 5/22). This may relate to the specific visual demands of factory work, where near-vision tasks often less affected by mild myopia predominate.

Age (p = 0.224), gender (p = 0.384), and the magnitude of spherical equivalent in either eye (SE right: p = 0.080; SE left: p = 0.168) were not significantly associated with compliance behaviour in this cohort (Table 3).

Table 3. Factors associated with spectacle non-compliance: bivariate analysis

Variable	Compliant (n = 63)	Non-compliant (n = 32)	Total (N = 95)	p-value
Residence				0.006
Rural	16 (25.4%)	18 (56.2%)	34 (35.8%)	
Urban	47 (74.6%)	14 (43.8%)	61 (64.2%)	
Education				0.025
Graduate/Diploma	29 (46.0%)	9 (28.1%)	38 (40.0%)	
Higher Secondary	24 (38.1%)	10 (31.2%)	34 (35.8%)	
Secondary	10 (15.9%)	13 (40.6%)	23 (24.2%)	
Type of error				0.047
Myopia	19 (30.2%)	18 (56.2%)	37 (38.9%)	
Hyperopia	27 (42.9%)	9 (28.1%)	36 (37.9%)	
Astigmatism	17 (27.0%)	5 (15.6%)	22 (23.2%)	
Age, mean (SD)	39.8 (3.3)	40.7 (3.2)	40.1 (3.3)	0.224
Gender				0.384
Male	35 (55.6%)	14 (43.8%	49 (51.6	

		)	%)	
Female	28 (44.4%)	18 (56.2%)	46 (48.4 %)	
SE Right (D), mean (SD)	2.1 (0.5)	2.0 (0.5)	2.1 (0.5)	0.0 80
SE Left (D), mean (SD)	2.0 (0.5)	2.1 (0.4)	2.0 (0.5)	0.1 68

DISCUSSION

This cross-sectional study of 95 factory workers attending a health checkup at a tertiary care centre revealed that approximately one-third (33.7%) of workers with a prescribed refractive correction were non-compliant with spectacle wear. The significant determinants of non-compliance were rural residence, lower educational attainment, and myopic refractory error. Personal and spectacle-related barriers emerged as the predominant reasons for non-adherence.

The observed non-compliance rate of 33.7% in the present study is comparable to rates reported in previous studies from India and other low- and middle-income countries. A meta-analysis of 23 cross-sectional studies on spectacle compliance reported an overall compliance rate of approximately 40%, with considerable variation across populations.[7]

Gogate et al. reported a 20% non-wear rate among rural school children in Pune, India, even when spectacles were provided free of charge.[6] Pawar et al. similarly reported that about 20% of school children in South India were not wearing spectacles at follow-up, with lost or broken spectacles being the most common reasons.[8]

In the current study, the higher non-compliance rate compared to paediatric populations may reflect the additional complexities of adult decision-making, competing occupational priorities, and the absence of parental or institutional encouragement.

The significantly higher non-compliance among rural workers (56.2%) compared to urban workers (43.8%) ($p = 0.006$) is consistent with the broader literature on health service access in rural India. Rural populations face compounded barriers including distance to eye-care facilities, limited access to replacement spectacles, and reduced exposure to health education. This finding is congruent with reports from Pavithra et al., who demonstrated better compliance among urban school children compared to their rural counterparts.[9]

The inverse relationship between educational level and non-compliance supports the hypothesis that health literacy plays a mediating role in spectacle adherence. Workers with only secondary education had the highest non-compliance rate (40.6%), while graduates/diploma holders had the lowest (28.1%). This gradient suggests that health education interventions should be tailored to the literacy level of the target population, using simplified messaging and visual aids for less-educated workers.

The association between myopia and non-compliance ($p = 0.047$) is an interesting finding. Workers with myopia had the highest rate of non-compliance (56.2%), while those with astigmatism were the most compliant. A possible explanation is that mild myopia may not significantly impair near-vision tasks that predominate in factory work, leading workers to perceive a lower need for correction. Conversely, astigmatism affects both near and distance vision, making its impact on daily activities more noticeable and thereby motivating consistent spectacle use.

The predominance of personal causes (37.5%) as a barrier to compliance aligns with findings from other Indian studies. Personal barriers, including forgetfulness and a lack of perceived need, are modifiable through targeted health education and periodic reinforcement during follow-up visits. Spectacle-related causes (34.4%), such as discomfort, broken frames, and aesthetic concerns, point to the need for improved frame selection and fitting during the dispensing process. Financial causes (28.1%) highlight the economic barrier to replacement and repair, which is particularly relevant for daily-wage or lower-income workers.

Age, gender, and the magnitude of refractory error did not significantly influence compliance in this cohort. The lack of gender-based difference is consistent with findings from Pawar et al., though some previous studies have reported gender disparities, particularly in paediatric populations where social and psychological barriers to spectacle use disproportionately affect girls.[8]

Certain limitations of this study warrant consideration, the cross-sectional design precludes the establishment of causal relationships between determinants and non-compliance. Further, the reliance on self-reported compliance may introduce social desirability bias, potentially leading to an overestimation of compliance rates. Also, the study was conducted at a single tertiary care centre, which may limit the generalisability of the findings.

CONCLUSION

This cross-sectional study among factory workers at a tertiary care centre demonstrates that approximately one in three workers (33.7%) were non-compliant with prescribed spectacle wear. Non-compliance was significantly associated with rural residence, lower educational attainment, and myopic refractory error. Personal causes (37.5%) and spectacle-related issues (34.4%) emerged as the predominant barriers. These findings underscore the need for targeted interventions addressing the modifiable determinants of non-compliance.

The study highlights that spectacle compliance is not merely a function of prescription availability but is influenced by a complex interplay of demographic, educational, clinical, and socioeconomic factors. Addressing these barriers through tailored health education, improved spectacle dispensing practices, and financial support mechanisms could enhance compliance rates and contribute to improved occupational safety and productivity among factory workers.

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