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Psychosocial Predictors of Relapse Among Patients with Substance Use in Pakistan

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ABSTRACT

Relapse in people with substance use disorders (SUDs) is among the most significant issues to be considered in terms of public health, especially in Pakistan, where the number of substance users is increasing, and the psychosocial factors influencing relapse are not well researched. The research focuses on the relationship between perceived stress and perceived stigma and the risk of relapse in 178 patients (116 males, 62 females) aged between 20 and 65 years and taking part in the rehabilitation centers in Islamabad and Rawalpindi. With the help of validated tools (PSS, PSAS, SRRS) and descriptive statistics, correlation, regression analysis, and independent-samples t-tests, the results obtained demonstrate that perceived stress ($\beta = .39$, $p < .001$) and perceived stigma ($\beta = .15$, $p = .028$) significantly predict relapse, 20% of which is explained. The women and jobless people expressed a lot of stress and when people started taking drugs earlier it became more vulnerable to drug use. This paper indicates that stress-management and stigma-reduction interventions should be incorporated into rehabilitation programs. Future studies need to have large and more diverse samples and longitudinal designs to enhance relapse-prevention strategies.

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1. Introduction

SUD is a long-standing and recurring relapsing disorder that continues to affect the world with a lot of social, psychological, and economic costs. The importance of the issue is proved by the fact that one out of every 247 million people is involved in illicit drug use and almost 29.5 million people has a substance-related disorder (Hanif, Kliewer, & Riaz, 2019; UNODC, 2019). Substance use prevalence in Pakistan has been growing at an appalling rate, with the number of people who have been using illicit drugs during a year roughly six percent and over eight million people are now dependent (Express Tribune, 2017; UNODC, 2013). Young adults are of specific risk as they are still influenced by their peers, pressured at school, lack jobs, and are not aware of the psychological effects of using substances. Additional reports in Islamabad and Rawalpindi also demonstrate the increasing level of drug abuse among university students, which can be taken as a sign of a developing crisis that needs an evidence-based intervention (Sabri, Greene, & Lucas, 2019; UNDP, 2017). One of the most tenacious problems of the treatment and long-term management of SUDs is relapse. It is recommended by international studies that 85 percent of people relapses within the first year of recovery (Sinha, 2007). Relapse does not merely indicate that treatment is ineffective, but it highlights the intricate nature of the interaction between psychological and social as well as environmental factors that influence the ability of individuals to abstinence. Amongst them,

perceived stress is a significant determinant. Stress causes cravings, interferes with emotion management, impairs judgment and reinstates brain circuits that have previously been involved in drug consumption thus enhancing chances of relapse (Sinha, 2008). Maladaptive coping mechanisms of drug use are used by people with chronic stress or limited coping resources especially in settings where socio-economic stress, family conflict, or unemployment is too great. Such stressors are prevalent in Pakistan and thus stress is a very salient risk factor to those struggling to uphold recovery.

Another effective psychosocial factor in relapse is perceived stigma. Stigma has negative attitudes of the society to people with SUDs and it may have devastating emotional and behavioural effects. The subjective stigma, or how people think other people perceive their use of substances, has been indicated to lower self-esteem and heighten shame, interrupt treatment adherence, and discourage help-seeking behaviours (Luoma et al., 2012). Stigma is particularly widespread in South Asian cultures, where people are rejected in the workplace, marital relationships, and even by society (Abbas et al., 2021). Cultural demands and ethical considerations disfavor women, which in turn marginalizes female drug users further and limits their chances to seek treatment services (Rafiq et al., 2025). Stigma also undermines the creation of the identity of recovery, a critical aspect of the Social Identity Model of Recovery in which individuals are expected to need and have acceptance, supportive networks, and positive group identification in order to maintain the behavioural change in the long term. Although substance use and relapse are very common in Pakistan, little is known about their psychosocial determinants in the literature. Current studies have concentrated mostly on prevalence patterns or socio-demographic features of drug users and little has been done in analyzing the psychological factors like stress and stigma that can directly influence the risk of relapse. Furthermore, although research has found gender, age at time of drug initiation, and employment as having a role, the overall role of age, difference in genders and employment in relapse in clinical practice is not clearly defined. An example of such is unemployment as it has been linked to increased stress and drug use, but its impact on relapse among Pakistani patients has seldom been empirically investigated. On the same note, pre-adolescent onset in drug use has continued to be strongly correlated with increased psychological susceptibility and intensity of dependence, but its relationship with stress and relapse is yet to be studied (Chen, Storr, & Anthony, 2009).

With such gaps, the current research seeks to examine the assumption that perceived stress and perceived stigma can be used to predict relapse in the treatment of patients with substance use disorders in rehabilitation centres in Islamabad and Rawalpindi. The study, on assessing these psychosocial predictors and demographic characteristics, including gender, age of first drug use and employment status aims at giving a more holistic picture of relapse vulnerability in Pakistani setting. This evidence is vital in clinical practice as well as in policy making by the government due to rising healthcare expenses, instability in the family, loss of productivity, and continuation of drug related injury. This study is important because it can inform the creation of evidence-based culturally-specific interventions. Cognitive-behavioural, mindfulness-based, and emotional regulation training as the elements of stress-management can be incorporated into the rehabilitation programs to reinforce the coping mechanisms and decrease the relapse. Psychoeducation, community awareness campaigns and supportive counselling can also be used to address stigma thereby reintegrating and enhancing long term recovery. The practitioners will also be able to develop specific responses to the identification of the high-risk groups, including young people, females, and the unemployed. Also, the research results can be used to inform future studies to consider longitudinal designs, integrate physiology stress indicators, and examine relapse processes among the urban and rural populations to enlarge the national evidence base.

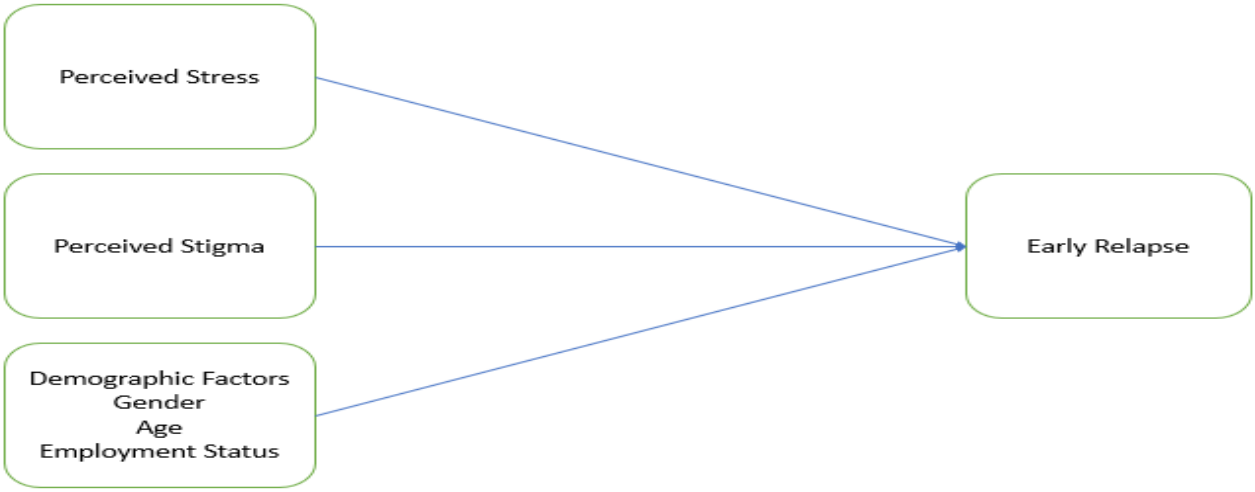
2. Literature Review

Substance use disorder (SUD) has been accepted as a persistent relapsing disorder with a complex combination of psychological, social, and environmental factors. The world has seen evidence that recurrence is one of the most difficult predictable problems of addiction treatment because between 60-85 percent of patients begin once more using drugs within a year of treatment (Sinha, 2007). Other more recent studies also suggest that psychosocial mechanisms, and not pharmacological variables only, are the determinants of relapse patterns (Witkiewitz, Pfund, & Tucker, 2022). Structural stressors which are central to relapse phenomenon including unemployment, poverty, poor social support, and high levels of stigma

about addiction are very much relevant in Pakistan and other South Asian nations, however, empirical research is very limited. Such paucity clarifies why psychosocial predictors of relapse should be studied systematically in treatment seeking patients. It has been found that perceived stress is a critical factor that contributes to substance use and relapse. Traditional neurobiological studies reveal that stress triggers the hypothalamic–pituitaryadrenal (HPA) axis and sensitizes the reward systems, enhancing the intensity of craving and the lack of impulse control (Sinha, 2008). New research also confirms that people who undergo a greater extent of perceived stress experience relapse more than people who undergo less perceived stress (especially in low-resource settings that have few coping resources) (Bravo, 2021; Hyman, 2020). Emotional regulation is disordered by exposure to stress and lessens involvement in networks that offer support to recovery, making it more difficult to remain abstinent in patients. The developing nations experience evidence demonstrating the influence of social and economic instability on increasing the risk of relapse caused by stress (Narayana, 2021). Unemployment, family conflicts, trauma, financial instability and absence of mental health services are some of the stress-related vulnerabilities in Pakistan, which increases the likelihood of relapse in patients receiving rehabilitation. In spite of these facts there are very little studies that have quantitatively investigated the direct predictive relationship between perceived stress and the relapse risk in the Pakistani rehabilitation context.

Another important psychological challenge that predetermines the course of recovery is perceived stigma. Stigma has effects on relapse by bringing in internalised shame, low help-seeking, social isolation, and corrosion of self-efficacy (Luoma et al., 2012). Patients who consider themselves undervalued or excluded by the society usually come up with negative self-schemas, which negatively interfere with the treatment process and adaptation to society. According to recent studies, the perceived stigma is a strong predictor of the psychological distress, treatment avoidance, and early relapse in different populations (Kulesza, 2020; Yang, 2022). In Pakistan, a collectivist culture, cultural values exaggerate stigma by linking substance use to moral incompetence, low character, and disgrace to the family. Women patients are twice stigmatized as there are gendered norms of modesty and social conformity (Rafiq et al., 2025). Although it has been highlighted in the literature around the world that stigma is a potent tool in defeating recovery, there is a major gap in the literature and empirical studies of the research topic in Pakistan are very few and largely descriptive, which this study will fill. Among factors contributing to relapse risk, there are demographic factors like age of onset, gender, and employment that are more significant than stress and stigma. Earlier the onset of substance use has been linked with greater dependency, greater craving and increased relapses (Chen, Storr, & Anthony, 2009). The patterns of relapse are also gender-based, where women tend to undergo greater stress, stigma, and impediments to care and record worse outcomes (Greenfield, 2020). Employment is also a protective force, as it increases financial and social integration, and unemployment increases stress and hopelessness and predisposes to relapse (Pinto et al., 2021). Although these predictors have been studied in international contexts, there are limited studies in Pakistan on systematic research especially those that employed reliable psychological measures and sound statistical analysis.

Figure 1



Regardless of the presence of the extensive theoretical debate, the number of empirical studies that explored combined psychosocial predictors of relapse in an individual within the Pakistani rehabilitation centers is evidently lacking. The interest has mostly been laid on prevalence rates, type of drug, or overall socio-demographic correlates but hardly on psychological determinants in the light of standardized quantitative tools. This places a significant research gap particularly on the role of stress and stigma in relation to the demographic vulnerability to determine the extent of relapse. Based on these gaps, the current research uses the Social Identity Model of Recovery (SIMOR) that states that the recovery process is enhanced in situations when people internalize a positive recovery identity. The identity of recovery is impaired by stress as it affects coping and social interaction and stigma supports negative identities and prevents the association with recovery-support groups (Best et al., 2016). Conceptually, the research presupposes that relapse vulnerability is affected by a high level of perceived stress and perceived stigma on their own and the level of risk is additionally dependent on demographic factors (Figure 1). In this way, the conceptual framework makes perceived stress and perceived stigma the main psychosocial predictors of relapse, which are moderated or affected by demographic variables, including gender, employment, and age of onset.

3. Methods

To study psychosocial predictors of relapse in substance use disorder patients, a quantitative, cross-sectional design was used. The purposive sampling method was used due to the fact that the availability of clinically diagnosed people depends on the communication with the treatment centers and inclusion of the participants who fit certain diagnostic and treatment-related standards. The ultimate sample comprised 178 patients between the age of 20 and 65 years. The required number of participants to identify the medium effect size with 80% power using multiple regression to detect significant effects was 107, which was determined by a post-hoc power analysis using the G power (Faul et al., 2009) and that the sample size acquired was sufficient. The inclusion criteria required the study participants to have been diagnosed with SUD in accordance with the DSM-5-TR, to actively be using substances more than one year, and to be able to understand questionnaire items. The severe sufferers of psychiatric comorbidity or the chronic physical condition that might interfere with participation were excluded. The research variables were measured using standardized and psychometrically validated measures. The measures of perceived stress were represented by the Perceived Stress Scale (PSS-10) which is a well-known instrument that measures how people perceive life circumstances to be stressful (Cohen, Kamarck, & Mermelstein, 1983). A Perceived Stigma Scale (PSAS) was used to measure the perceived stigma, the scale measures internalized stigma and the feeling of rejection of the society towards addicted persons (Luoma et al., 2012). The vulnerability to relapse was also assessed through the use of the Stimulant Relapse Risk Scale (SRRS) which is a 18 item scale that was designed to measure craving, emotional instability, and cognitive predictors of relapse (Ogai et al., 2013). The reliability coefficients that were acquired during the work were in line with benchmarking values reported in previous studies.

The processes of data collection were done in an ethical and systematic way. The consent of the rehabilitation centres followed and individuals were approached in individual rooms to ensure confidentiality. The nature of the study, voluntary participation, and protection of confidentiality were described before data was collected. Informed consent was obtained through writing and every questionnaire took about 20-25 minutes to complete. The Institutional Review Board of MY University gave the ethics approval to the research. The SPSS version 26 was used to carry out the statistical analyses. Demographic traits and scores of the scale were summarized in the descriptive statistics. Pearson correlation coefficients were calculated to test the relationship between important variables. The predictive value of the perceived stress and perceived stigma on the risk of relapse was assessed using multiple regression analysis. Independent-samples t-tests were applied in order to compare gender and employment-related variations in stress and stigma scores, which is in line with the analysis methods of previous research on relapse. Every ethical consideration such as the anonymity, confidentiality and right to withdraw was strictly followed during the study.

4. Results and Discussion

Table 1: Frequencies and Percentages of Demographic Variables (N = 178)

Variable	f	%
Male	116	65.2
Female	62	34.8
Employed	91	51.1
Unemployed	87	48.9
Daily/Almost Daily Use	48	27.0
Weekly Use	12	6.7
Monthly Use	5	2.8
Multiple Times Per Day	18	10.1
Specific/Quantity/Miscellaneous	10	5.6
Infrequent/Occasional Use	21	11.8
Under Treatment/Other	74	41.6
Opioids	20	11.2
Stimulants	30	16.9
Cannabinoids	69	38.8
Sedatives/Hypnotics	20	11.2
Hallucinogens	1	0.6
Other Psychoactive Substances	38	21.3

Note: f= frequency, %=percentage

The demographic features presented in Table 1 are also the important background of the interpretation of the psychosocial predictors of relapse. Males made up the majority of the sample (65.2%), similar to the national data, which indicates that more males seek treatment among substance use disorder patients in Pakistan (UNODC, 2019). Nevertheless, the large percentage of females (34.8) is remarkable, suggesting the growing vulnerability of females- a situation the recent South Asian research revealed social stressors, stigmatization, and limited movement exacerbate addiction vulnerability in females (Batool et al., 2017). The employment situation was fairly equal, with 51.1% of the respondents being employed and 48.9% being unemployed, which indicates that economic instability is a common issue among patients who want to be treated. The majority of the participants were reported to use drugs every day or almost every day (27.0%), infrequently/other (41.6%), which indicates the instability of consumption that increases the risk of relapse (Chen et al., 2009). The most common type of drug (38.8%) was cannabinoids, which is in line with the growing accessibility and acceptance of cannabis products in Pakistan. This population distribution highlights the fact that risk factors that might contribute to psychological stress and relapse are heterogeneous

Table 2: Psychometric Properties of the Scales (N = 178)

Scale	k	α	M	SD	Range (Potential)	Range (Actual)	Skewness	Kurtosis
Perceived Stress Scale	10	.73	31.05	4.97	1–50	11–47	–0.65	4.01
PSAS	8	.64	11.84	3.20	0–24	0–21	–0.99	2.67
Risk of Relapse Scale	18	.92	35.09	14.15	0–72	0–64	–0.50	–0.34

Note. PSAS= Perceived Stigma of Addiction Scale, k = number of items; M = mean; SD = standard deviation; α = Cronbach's alpha

Table 2 indicated that the psychometric properties of the scales (Table 2) exhibited acceptable levels of reliability of all measures with Cronbachs alpha values ranging between.64 and .92. The Perceived Stress Scale (α = .73) and the Risk of Relapse Scale (α = .92) had an acceptable level of internal consistency, which is consistent with the standards of other studies conducted with the purpose of international validation (Cohen et al., 1983; Ogai et al., 2007). Although the Perceived Stigma of Addiction Scale admitted a small reliability coefficient (α = .64), it was still within the acceptable range of psychological constructs with variable variability depending on the situation. The value of skewness and kurtosis are within reasonable values, and this means that the distribution is normal and justifies the use of parametric tests.

Table 3: Correlations Between Age of Taking First Dose of Drug, Duration of Use, Perceived Stress, Perceived Stigma of Addict, and Risk of Relapse (N=178)

Variable	1	2	3	4	5
Age of First Dose	—	0.17*	-0.46**	0.02	0.43*
Duration of Use		—	-0.00	0.20*	0.81**
Perceived Stress			—	0.17*	0.43**
Perceived Stigma				—	0.29**
Risk of Relapse					—

The correlated findings (Table 3) illustrated that there were a number of statistically significant results, which can be used to explain psychosocial processes that govern relapse. The age of starting taking of drug was also negatively correlated with the perceived stress (r = -.46, p <.01) and positively correlated with the risk of relapse (r =.43, p <.05), and thus, the earlier one starts taking drug, the more he or she experiences stress and the greater the likelihood of relapse. This observation is also aligned with longitudinal studies that have identified early initiation as being linked to future addiction and relapse susceptibility because of impaired psychological development (Greenfield et al., 2020). The time of drug use showed a strong correlation with risk of relapse (r =.81, p <.01), which once again confirms that the longer a person is exposed to psychoactive substances, the worse their impulse control is and the more they get dependent (Witkiewitz et al., 2022). There was a moderate relationship between perceived stress and risk of relapse (r =.43; p < .01) which is supportive of theoretical models in which stress is pivotal as a driver of craving and relapse (Sinha, 2007). Perceived stigma also exhibited another significant but less strong positive connection with relapse (r = .29, p < .01), which is consistent with the existing evidence of perceived stigma denting motivation to recover and promoting internalized shame (Kulesza et al., 2020; Yang et al., 2022).

Table 4: Regression Analysis Predicting Risk of Relapse (N = 178)

Variable	B	SE B	β	p	95% CI for B	Tolerance	VIF
Constant	-6.337	6.310	—	.317	[−18.794, 6.119]	—	—
Perceived Stress	1.078	.197	.388	< .001	[.690, 1.466]	.927	1.08
Perceived Stigma	.699	.310	.157	.028	[.077, 1.321]	.927	1.08

Note. CI = confidence interval, VIF = variance inflation factor, p < .05. p < .01.

Table 4 also revealed through the regression analysis that stress and stigma are additional predictors of vulnerability to relapse. Perceived stress turned out to be the best predictor (β = .388, p < .001), which means that a high level of stress is a strong indicator of a higher likelihood of relapses despite the fact that stigma was controlled. Stress-craving models are also a good reinforcement of this as they assume that stress triggers neurobiological reward systems associated with substance-seeking behavior (Sinha, 2008). Perceived stigma also played a great role in predicting relapse risk (β = .157, p = .028), which may be due to the significant role social identity processes play in recovery (Luoma et al., 2010). The explained variance was 20% (R^2 = .20), which implies that psychosocial variables are significantly influential, but the role of other factors such as trauma, family conflict, and peer influence is also possible. The fact that the acceptable values of VIF (1.08) are not below this value confirms that multicollinearity was not an issue.

Table 5: Independent Sample t-Test Comparing Gender Difference on Perceived Stress, Perceived Stigma Related to Addiction, and Risk of Relapse (N=178)

Variable	Group	M	SD	t(176)	p	Cohen's d
Perceived Stress	Male	30.43	4.43	2.23	.02	0.37
Perceived Stress	Female	32.17	5.71			
Perceived	Male	11.38	3.45	-1.55	.12	-0.26

Stigma						
Perceived Stigma	Female	12.12	3.03			
Risk of Relapse	Male	36.20	11.91	-1.40	.16	-0.23
Risk of Relapse	Female	33.08	17.44			

Note. M = mean; SD = standard deviation

Comparisons of gender (Table 5) showed that there were significant differences in the perceived stress (t = 2.23, p = .02), and females were more prone to stress (M = 32.17) than males (M = 30.43). This is consistent with the literature that reported an elevated level of psychological distress among women because of the escalated care giving burden, stigma, and social penalties related to substance use (Greenfield, 2020; Rafiq et al., 2025). Nonetheless, there were no notable gender differences in stigma (p =.12) or relapse (p =.16) that might indicate a growing phenomenon of normalization of substance use and associated treatment barriers among genders in urban Pakistan. The effect sizes were medium to low, which implies that stress is the most salient gender-specific psychosocial variable that has an impact on relapse.

Table 6: Independent Sample t-Test Comparing Mean Difference in Employment Status on Perceived Stress, Perceived Stigma Related to Addiction, and Risk of Relapse (N=178)

Variable	Group	M	SD	t(176)	p	Cohen's d
Perceived Stress	Employed	30.37	3.84	-1.88	.03	-0.28
Perceived Stress	Unemployed	31.77	5.82			
Perceived Stigma	Employed	12.09	3.52	1.06	.28	0.16
Perceived Stigma	Unemployed	11.58	3.80			
Risk of Relapse	Employed	35.98	12.56	0.84	.39	0.12
Risk of Relapse	Unemployed	34.17	15.64			

Note. M = mean; SD = standard deviation; CI = confidence interval; LL = lower limit; UL = upper limit.

Table 6 provides t-test comparisons in employment status. The perceived stress level was found to be significantly greater in the case of the unemployed (t = -1.88, p =.03, d = -0.28), which indicates that unemployment is one of the most important ways to experience stress that is associated with relapse- the same was reported by Pinto et al. (2021), with the authors noting that economic hardship is a significant factor contributing to increased levels of psychological distress and substance dependency. Nonetheless, the results indicated no significant differences in stigma (p =.28) or relapse (p =.39) depending on employment groups, which implied that the psychological process that influences recovery outcomes was stress rather than stigma or the intensive level of use.

When these findings are incorporated into the framework of Social Identity Model of Recovery (SIMOR), the negative impact of stress and stigma on the formation of recovery identity is also revealed. Stress undermines the ability to act in recovery-related ways, as well as emotions, whereas stigma upholds an identity of an addict related to shame and shunning of support systems (Best et al., 2016). Stress and stigma have important predictive effects on relapse, which support the assumptions of SIMOR that psychosocial processes are central in relapse prevention. On the whole, the findings indicate that perceived stress is the most critical psychosocial predictor of relapse in patients under treatment. Stigma is also a contributor of relapse although to a lesser degree, thus the pressing need to apply stigma-reduction intervention in treatment programs. These psychological processes are moderated by demographic factors (gender, early initiation, unemployment, and duration of use) and determine the likelihood of relapse. The findings are consistent with other global and regional researches and are an extension of the evidence in that they offer quantitative evidence in the Pakistani rehabilitation context.

5. Conclusion, Implications, Limitations, and Future Research Directions

This paper has examined psychosocial predictors of relapse in patients with substance use disorders in Pakistan and their role has been looked at in terms of perceived stress and perceived stigma and demographic variables that include gender, employment, age of first drug use, and length of use. The results reveal that relapse is strongly necessitated by interplay of emotional, social, and contextual factors that influence vulnerability of individuals in the treatment and recovery process. Perceived stress was identified as the most effective predictor of relapse as it showed that the more emotional strain a person goes through the more, they are likely to relapse to consumption. The perceived stigma did not leave behind in significance to risk relapse as it is a manifestation of the negative effect of shame, social judgment, and internalizing negative identities on the recovery process. Early initiation of drug use, gender (women), unemployment, and long-term use were also demographic factors that increased vulnerability to relapses. Collectively, these results highlight the complexity of relapse and the importance of comprehensive methods of treatment.

The study implications are applicable to clinical practice, the policy of the public health, and the addiction treatment programs in Pakistan. Combining formal elements of stress management, including mindfulness-based interventions, cognitive-behavioral training on teaching coping skills, and emotional regulation skills training, may help decrease relapse caused by stress. A positive recovery identity can be developed through stigma-reduction interventions, such as psychoeducation of the family members, community-based awareness strategies, and narrative reframing facilitated by a therapist. Gender-specific and employment-oriented rehabilitations, including vocational training, financial counselling, and special psychosocial support of women with increased emotional distress, might be advantageous to rehabilitation centers. Policymakers can assume the reinforcement of community reintegration initiatives, the creation of more vacancies that recovering people can occupy, and the creation of better awareness in the country about the issue of addiction as a condition and not a vice. It has a number of limitations to consider. Purposive sampling restricts the applicability of the results to the larger populations. The cross-sectional design also limits the possibility to draw a causal relationship between stress and stigma and the result of relapse. Even though self-report measures are extensively validated, they can be affected by reporting bias especially in the case of variables like stigma or emotional distress.

The research had been carried out within urban rehabilitation centers, which is why the research findings might not be applicable in rural settings where access to treatment, gender roles, and social approval are dramatically different. Lastly, the model explained 20% of the variation in relapse risk and this implies that there existed other psychosocial, environmental and physiological factors that were not included in the present design. Future studies ought to consider longitudinal designs in analyzing the dynamics of stress and stigma at various phases of recovery and how they vary as time passes in shaping the pattern of relapse. The research that would also include qualitative interviews would give more information on cultural and social experiences, which form the addiction and stigma in Pakistan. To enhance the predictive accuracy, future models might consider having variables like trauma history, family support, coping styles, emotional regulation and readiness to change. Comparisons made between the rehabilitation environment in a public and a private setting and between rural and urban population may yield meaningful information about the differences in context. The integration of biological indicators of stress (e.g., cortisol levels) and digital tools to monitor relapse might contribute to the progress of accurate predicting of relapse. Altogether, increased study on this topic will lead to culturally sensitive evidence-based frameworks of relapse-prevention in Pakistan and other low-resource contexts.

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