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IMPACT OF SOCIAL MEDIA ALGORITHMS ON MENTAL HEALTH AMONG YOUTH IN PAKISTAN: A MIXED-METHODS STUDY

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ABSTRACT

The rapid growth of social media platforms and the increasing use of algorithm-driven content recommendation systems have significantly transformed the digital experiences of youth worldwide. In Pakistan, young individuals are among the most active users of social networking platforms, making them increasingly vulnerable to the psychological effects of algorithmically curated content. This study examined the impact of social media algorithms on the mental health of youth in Pakistan using a mixed-methods research approach. The study specifically investigated the relationship between algorithmic social media exposure and psychological outcomes including anxiety, depression, self-esteem, emotional dependency, and social media addiction. A cross-sectional quantitative survey was conducted among 350 university students and young social media users from major urban areas of Pakistan using structured questionnaires and stratified random sampling techniques. In addition, semi-structured interviews were conducted with 20 participants to gain deeper qualitative insights into personal experiences related to algorithm-driven social media usage. Quantitative data were analyzed using descriptive statistics, correlation analysis, and multiple regression techniques, while qualitative responses were examined through thematic analysis. The findings revealed that social media algorithms significantly contributed to increased anxiety, depressive symptoms, emotional dependency, and addictive social media behaviors among youth. The study also found a significant negative relationship between algorithmic exposure and self-esteem. Qualitative findings further indicated that personalized content feeds, continuous recommendations, social comparison, and fear of missing out intensified emotional stress and psychological pressure among participants. The study concluded that social media algorithms function as influential psychological systems capable of shaping emotions, behaviors, and mental well-being among Pakistani youth. The study provides important implications for educators, mental health professionals, policymakers, parents, and social media companies regarding the need for digital literacy, ethical algorithmic practices, and mental health awareness initiatives to promote healthier online environments for youth in Pakistan.

Keywords: *Social Media Algorithms; Mental Health; Youth in Pakistan; Anxiety; Depression; Social Comparison; Social Media Addiction; Digital Well-Being; Algorithmic Personalization; Mixed-Methods Study.*

INTRODUCTION

The rapid expansion of social media platforms has transformed communication patterns, information consumption, and worldwide. In Pakistan, increasing internet penetration,

affordable smartphones, and widespread access to platforms such as Instagram, TikTok, Facebook, and YouTube have significantly increased digital engagement among adolescents and young adults. Social media algorithms, which personalize content through machine learning and predictive analytics, play a central role in shaping users' online experiences by recommending videos, posts, advertisements, and interactions based on previous behaviors, preferences, and engagement patterns. While these algorithmic systems improve user engagement and platform retention, scholars and mental health experts increasingly argue that they may contribute to psychological distress, emotional dependency, social comparison, anxiety, depression, and reduced self-esteem among youth (Arora et al., 2024; Niaz et al., 2024).

Globally, concerns regarding the psychological consequences of algorithm-driven social media environments have intensified in recent years. Research indicates that recommendation algorithms often prioritize emotionally stimulating, sensationalized, and highly engaging content, which can expose young users to unrealistic lifestyles, cyberbullying, harmful beauty standards, misinformation, and emotionally triggering material (Khalaf, 2023; Arora et al., 2024). Studies further reveal that excessive exposure to curated online content may create "filter bubbles" and "echo chambers," limiting balanced perspectives while reinforcing negative emotions and addictive usage behaviors (Subhani et al., 2024).

The psychological implications of such algorithmic personalization are particularly significant for adolescents and young adults because this demographic is in a critical developmental stage characterized by identity formation, emotional sensitivity, and heightened peer influence.

In Pakistan, social media usage among youth has grown rapidly during the last decade, particularly in urban and semi-urban regions. Pakistani youth increasingly rely on social media platforms not only for entertainment but also for education, political awareness, social networking, and self-expression. However, the growing dependency on algorithmically curated platforms has raised concerns regarding digital addiction, sleep disruption, emotional instability, loneliness, and social isolation. Niaz et al. (2024) found that social comparison, cyberbullying, and excessive social media engagement were strongly associated with poor mental well-being among Pakistani young adults. Similarly, Bilal (2024) reported that intensive digital media consumption negatively affected psychological well-being, self-esteem, and attention span among university students in Pakistan.

Algorithmic recommendation systems are specifically designed to maximize user engagement through continuous scrolling, personalized notifications, autoplay features, and content reinforcement mechanisms. Although these features increase platform efficiency and user satisfaction, they may simultaneously contribute to compulsive usage patterns and emotional dependency. Research has demonstrated that algorithmic amplification of emotionally charged or appearance-focused content can intensify feelings of inadequacy, fear of missing out (FOMO), and depressive symptoms among adolescents (Abbasi et al., 2024). Furthermore, exposure to repetitive negative content through algorithms may normalize harmful behaviors, intensify anxiety, and increase psychological vulnerability among youth populations.

The Pakistani sociocultural environment adds another dimension to this issue. Cultural expectations, gender norms, family structures, and social pressures may influence how young people interact with social media content and interpret online experiences. For instance, women and girls in Pakistan may experience greater psychological pressure related to beauty standards, online harassment, and societal judgment within digital spaces. Research by He et al. (2024) highlighted that social media environments within patriarchal societies could negatively influence psychological well-being due to restricted social freedoms and heightened digital scrutiny. Consequently, understanding the relationship between social media algorithms and mental health requires context-specific investigation within Pakistan's unique cultural and socioeconomic setting.

Despite increasing global attention to social media and mental health, limited empirical research has specifically examined the influence of algorithm-driven content personalization on

Pakistani youth. Existing studies in Pakistan primarily focus on general social media usage rather than algorithmic mechanisms and their psychological implications. Moreover, many studies employ solely quantitative approaches, which may not fully capture the lived experiences, emotional perceptions, and behavioral responses of young users exposed to personalized digital environments. Therefore, a mixed-methods approach integrating quantitative surveys with qualitative interviews can provide a more comprehensive understanding of how social media algorithms shape mental health outcomes among youth in Pakistan.

This study aims to investigate the impact of social media algorithms on the mental health of Pakistani youth by examining the relationship between algorithmic exposure, emotional well-being, anxiety, depression, self-esteem, and behavioral addiction. The study further seeks to explore young users' perceptions and experiences regarding algorithmically curated content and its influence on their daily lives, emotional states, and social relationships. By integrating both quantitative and qualitative perspectives, the research intends to contribute to the growing body of literature on digital mental health while offering evidence-based insights for policymakers, educators, mental health professionals, and technology regulators in Pakistan.

Problem Statement

The rapid proliferation of social media platforms among youth has transformed patterns of communication, entertainment, learning, and social interaction across the globe. In Pakistan, increased internet accessibility, smartphone penetration, and affordable digital technologies have significantly expanded social media usage among adolescents and young adults. Platforms such as TikTok, Instagram, Facebook, Snapchat, and YouTube have become integral parts of young people's daily lives, influencing their opinions, emotions, relationships, and behavioral patterns. However, beyond general social media usage, the growing influence of algorithm-driven content personalization has emerged as a major concern for researchers, educators, and mental health professionals. Social media algorithms continuously analyze user behavior, preferences, engagement history, and online interactions to deliver highly personalized content intended to maximize user attention and platform engagement. While these algorithms improve user experience and digital connectivity, they may also contribute to adverse psychological outcomes among youth.

Algorithmic systems are designed to prioritize emotionally stimulating, sensationalized, and repetitive content, which can intensify prolonged screen exposure, addictive usage patterns, social comparison, cyberbullying, misinformation exposure, and emotional dependency. Youth, particularly adolescents and university students, are considered highly vulnerable to such psychological influences due to their developmental stage, emotional sensitivity, identity formation processes, and peer-oriented social behavior. Existing global studies have linked excessive exposure to algorithmically curated social media content with anxiety, depression, loneliness, reduced self-esteem, fear of missing out (FOMO), sleep disorders, and decreased psychological well-being. Despite growing international concern, limited empirical evidence exists regarding how these algorithmic mechanisms specifically affect the mental health of youth in Pakistan.

In the Pakistani context, sociocultural pressures, gender norms, academic stress, and limited awareness regarding digital mental health further intensify the potential risks associated with algorithm-driven social media environments. Pakistani youth are increasingly exposed to idealized lifestyles, unrealistic beauty standards, political polarization, online harassment, and emotionally manipulative content through algorithmic recommendations. However, most existing studies in Pakistan focus broadly on social media addiction or usage frequency while neglecting the specific role of recommendation algorithms and personalized content systems in shaping mental health outcomes. Furthermore, previous research has predominantly utilized quantitative methods, providing limited insight into the lived experiences, emotional perceptions, and behavioral responses of youth interacting with algorithmically curated digital spaces.

Therefore, there is a critical need for a comprehensive mixed-methods investigation that examines both the measurable psychological

impacts and the subjective experiences associated with social media algorithms among Pakistani youth. Understanding how algorithmic exposure influences anxiety, depression, emotional well-being, self-esteem, and social behavior is essential for developing effective digital literacy programs, mental health interventions, policy regulations, and responsible social media practices. This study seeks to address this gap by exploring the impact of social media algorithms on the mental health of youth in Pakistan through an integrated quantitative and qualitative research approach.

Research Questions

1. How do social media algorithms influence the mental health of youth in Pakistan?
2. What is the relationship between algorithm-driven social media exposure and psychological outcomes such as anxiety, depression, and self-esteem among Pakistani youth?
3. How do Pakistani youth perceive and experience algorithmically curated social media content in their daily lives?
4. To what extent do social media algorithms contribute to addictive social media behaviors and emotional dependency among youth?
5. What coping strategies and awareness levels exist among Pakistani youth regarding the psychological effects of social media algorithms?

Research Objectives

General Objective

To examine the impact of social media algorithms on the mental health of youth in Pakistan using a mixed-methods research approach.

Specific Objectives

1. To analyze the influence of algorithm-driven social media content on the psychological well-being of Pakistani youth.
2. To examine the relationship between social media algorithm exposure and mental health indicators such as anxiety, depression, stress, and self-esteem.
3. To explore the perceptions, experiences, and emotional responses of Pakistani youth toward algorithmically personalized social media environments.
4. To investigate the role of social media algorithms in promoting addictive usage behaviors and emotional dependency among youth.
5. To identify awareness levels, coping mechanisms, and preventive strategies related to the mental health effects of social media algorithms among Pakistani youth.
6. To provide recommendations for policymakers, educators, parents, mental health professionals, and digital platforms regarding healthier and more responsible social media usage practices in Pakistan.

Significance of the Study

This study is significant because it addresses the growing concern regarding the psychological impact of social media algorithms on youth in Pakistan, an area that remains underexplored in existing literature. As social media platforms increasingly rely on algorithm-driven personalization to maximize user engagement, understanding how these systems influence the mental health, emotions, and behaviors of young users has become critically important. The study contributes to academic knowledge by specifically examining the role of algorithmic content exposure rather than focusing solely on general social media usage.

The research is expected to provide valuable empirical evidence regarding the relationship between social media algorithms and mental health outcomes such as anxiety, depression, stress, self-esteem, emotional dependency, and addictive behaviors among Pakistani youth. By adopting a mixed-methods approach, the study will offer both statistical insights and in-depth understanding of youth experiences, perceptions, and emotional responses within algorithmically curated digital environments.

The findings of this study will be beneficial for policymakers and regulatory authorities in developing digital governance policies, online safety regulations, and youth protection frameworks related to social media usage in Pakistan. The study will also support educators and educational institutions in promoting digital literacy, responsible online behavior, and awareness regarding the psychological effects of

algorithmic content consumption among students.

Furthermore, mental health professionals and counselors may use the findings to design targeted intervention strategies, counseling programs, and awareness campaigns aimed at reducing the negative psychological effects associated with excessive social media exposure. Parents and families may also benefit from understanding how algorithmic systems influence the emotional well-being and behavioral patterns of young individuals, enabling them to guide healthier digital habits.

In addition, the study may encourage social media companies and technology developers to adopt more ethical and transparent algorithmic practices that prioritize user well-being alongside engagement metrics. Overall, this research will contribute to the broader discourse on digital mental health, responsible technology use, and youth well-being in Pakistan while providing practical recommendations for creating safer and healthier online environments.

Literature Review

The increasing integration of social media into everyday life has generated extensive scholarly interest regarding its psychological, behavioral, and social consequences, particularly among youth. Social media platforms such as TikTok, Instagram, Facebook, Snapchat, and YouTube utilize sophisticated algorithmic systems that personalize content according to users' preferences, engagement patterns, browsing history, and interaction behaviors. These algorithms are primarily designed to maximize user attention and platform engagement; however, researchers argue that such systems may simultaneously influence mental health outcomes, emotional stability, and behavioral patterns among adolescents and young adults.

Social Media Algorithms and User Engagement

Social media algorithms refer to automated computational systems that analyze user data to determine which content should appear on users' feeds, recommendations, and notifications. According to Arora et al. (2024), algorithmic recommendation systems use machine learning and predictive analytics to prioritize highly engaging content, often emphasizing emotionally stimulating, sensationalized, or visually appealing material. These systems encourage prolonged screen time and repeated interactions, increasing user dependency on digital platforms.

Research indicates that algorithm-driven personalization creates "echo chambers" and "filter bubbles," where users are repeatedly exposed to similar viewpoints, lifestyles, and emotional stimuli (Subhani et al., 2024). Such repetitive exposure may reinforce psychological vulnerabilities, emotional reactions, and addictive online behaviors. The persuasive design of algorithms, including infinite scrolling, autoplay features, personalized notifications, and engagement-based recommendations, has been associated with compulsive social media usage patterns among youth.

Mental Health and Psychological Well-Being of Youth

Mental health among youth has become a major public health concern globally, particularly with the expansion of digital technologies. The World Health Organization recognizes adolescents and young adults as highly vulnerable to anxiety, depression, stress, emotional instability, and behavioral disorders due to social, academic, and developmental pressures. Social media environments may intensify these vulnerabilities through constant social comparison, validation-seeking behaviors, and online peer influence.

Khalaf (2023) found that excessive social media exposure is significantly associated with increased symptoms of depression, anxiety, loneliness, and reduced psychological well-being among adolescents and young adults. Similarly, Twenge and Campbell (2019) argued that prolonged digital engagement contributes to emotional distress, sleep disruption, low self-esteem, and decreased face-to-face social interaction. The psychological effects are particularly severe when users become emotionally dependent on online feedback, likes, comments, and social approval mechanisms.

In Pakistan, mental health issues among youth are increasingly linked with excessive social media use. Niaz et al. (2024) reported that Pakistani youth exposed to high levels of social media engagement experienced emotional stress, social anxiety, and reduced self-confidence. The study further highlighted that cyberbullying, unrealistic online portrayals, and

social comparison significantly affected the emotional well-being of university students and adolescents.

Algorithmic Personalization and Anxiety

One of the most significant psychological concerns associated with social media algorithms is anxiety. Algorithms continuously recommend trending, emotionally charged, or socially competitive content that may increase fear of missing out (FOMO), peer pressure, and emotional insecurity among youth. According to Przybylski et al. (2013), FOMO is strongly connected with compulsive social media checking behaviors and emotional dissatisfaction.

Algorithmic exposure to idealized lifestyles, luxury culture, beauty standards, and achievement-oriented content can intensify feelings of inadequacy and self-comparison. Abbasi et al. (2024) found that exposure to appearance-focused social media content negatively affected body image satisfaction and psychological well-being among Pakistani youth, especially females. Similarly, Vogel et al. (2014) concluded that social comparison through social networking sites contributes to anxiety, stress, and lower self-esteem among adolescents.

Moreover, algorithms may repeatedly expose users to distressing news, controversial discussions, and emotionally polarizing content, thereby increasing emotional exhaustion and psychological stress. Continuous engagement with such content may normalize anxiety-inducing behaviors and reduce emotional resilience over time.

Depression and Emotional Dependency

Several studies have linked algorithmically curated social media environments with depressive symptoms among young users. Social media algorithms prioritize content that generates high engagement, often amplifying emotionally provocative or sensational material. Excessive exposure to such content may negatively influence mood regulation, emotional balance, and psychological well-being.

Keles et al. (2020) identified a strong association between excessive social media use and depression among adolescents. The study suggested that online comparison, cyberbullying, sleep disturbances, and emotional dependency significantly contribute to depressive symptoms. Likewise, Bilal (2024) observed that Pakistani university students who spent extended periods on social media reported higher levels of sadness, emotional instability, and social isolation.

Algorithmic reinforcement mechanisms further contribute to emotional dependency by continuously supplying personalized content that aligns with users' emotional triggers and behavioral preferences. This reinforcement creates habitual usage patterns where users repeatedly return to platforms seeking emotional gratification, entertainment, or validation. Over time, such dependency may reduce offline social interaction and increase emotional vulnerability.

Social Media Addiction and Behavioral Consequences

Social media addiction refers to excessive and uncontrollable use of social networking platforms that interferes with daily functioning, academic performance, emotional health, and interpersonal relationships. Researchers argue that algorithmic systems are intentionally designed to maximize engagement through dopamine-triggering reward mechanisms such as likes, shares, comments, and personalized recommendations.

Andreassen et al. (2017) explained that addictive social media behaviors are closely associated with psychological distress, impulsivity, and reduced emotional regulation. The constant availability of algorithmically tailored content encourages repetitive checking behaviors and prolonged online presence. Youth are particularly susceptible because of their developmental tendency toward novelty-seeking and peer validation.

In Pakistan, increasing smartphone penetration and internet accessibility have intensified concerns regarding social media addiction among adolescents and university students. Studies suggest that excessive digital engagement negatively affects academic concentration, sleep quality, physical activity, and emotional well-being. Subhani et al. (2024) further emphasized that social media algorithms significantly shape behavioral patterns and online consumption habits among Pakistani youth.

Cyberbullying, Online Harassment, and Emotional Trauma

Algorithmic amplification may also increase exposure to cyberbullying, toxic interactions, and harmful online content. Social media platforms often promote viral or controversial content to increase engagement, unintentionally exposing users to harassment, hate speech, and emotionally damaging interactions.

Research by Hinduja and Patchin (2020) found that cyberbullying is strongly associated with anxiety, depression, suicidal ideation, and emotional trauma among adolescents. In Pakistan, online harassment particularly affects female users due to sociocultural pressures and gender-based discrimination. He et al. (2024) observed that women in patriarchal societies experience greater psychological stress from digital interactions and online scrutiny.

The repeated exposure to negative interactions through algorithmic content recommendations may intensify emotional insecurity and reduce psychological well-being among youth. Victims of cyberbullying often experience fear, social withdrawal, and reduced self-esteem, which can negatively affect academic and social functioning.

Gaps in Existing Literature

Although substantial research exists regarding social media usage and mental health, several important gaps remain. First, many studies focus broadly on overall social media use rather than specifically examining algorithm-driven personalization and recommendation systems. Second, limited empirical research has explored the impact of social media algorithms within the Pakistani context, despite rapidly increasing social media penetration among youth. Third, most previous studies rely heavily on quantitative methods, providing limited understanding of users' subjective experiences, emotional interpretations, and coping strategies. Additionally, few studies integrate psychological outcomes such as anxiety, depression, emotional dependency, self-esteem, and addictive behaviors within a single analytical framework. There is also insufficient attention toward sociocultural factors that shape digital experiences among Pakistani youth, including gender norms, family expectations, and cultural pressures. Therefore, a mixed-methods investigation is necessary to provide a comprehensive understanding of how social media algorithms influence the mental health and behavioral experiences of youth in Pakistan.

Underpinning Theory

Social Comparison Theory

The underpinning theory for this study is the Social Comparison Theory, developed by Leon Festinger in 1954. The theory explains that individuals naturally evaluate their opinions, abilities, achievements, and self-worth by comparing themselves with others. According to the theory, people engage in two primary forms of comparison: upward comparison, where individuals compare themselves to those perceived as superior, and downward comparison, where individuals compare themselves to those perceived as less successful. These comparisons significantly influence emotions, self-esteem, attitudes, and psychological well-being.

In the context of social media, algorithm-driven platforms continuously expose users to carefully curated and idealized content, including images of beauty, wealth, lifestyles, achievements, and social popularity. Social media algorithms are designed to prioritize highly engaging content, which often includes unrealistic portrayals of success, attractiveness, and happiness. As a result, youth are repeatedly exposed to upward social comparisons that may generate feelings of inadequacy, dissatisfaction, anxiety, depression, loneliness, and reduced self-esteem.

The theory is highly relevant to this study because Pakistani youth actively engage with algorithmically personalized social media feeds that constantly reinforce comparison-based behaviors. Adolescents and young adults often evaluate their appearance, academic success, social relationships, and lifestyles against influencers, celebrities, peers, and online communities presented through social media algorithms. Continuous exposure to such content may intensify emotional stress, fear of missing out (FOMO), emotional dependency, and addictive social media behaviors.

Furthermore, Social Comparison Theory provides a strong conceptual foundation for understanding how algorithmic personalization influences mental health outcomes among youth. The theory explains the psychological

mechanisms through which repetitive exposure to idealized online content affects emotional well-being and behavioral responses. Therefore, this theory supports the investigation of the relationship between social media algorithms and mental health indicators such as anxiety, depression, stress, self-esteem, and emotional dependency among youth in Pakistan.

Hypotheses

H1: Social media algorithms have a significant negative impact on the mental health of youth in Pakistan.

H2: Algorithm-driven social media exposure is positively associated with anxiety among Pakistani youth.

H3: Algorithmically personalized social media content significantly increases depressive symptoms among youth in Pakistan.

H4: Social media algorithms negatively influence the self-esteem of Pakistani youth through social comparison behaviors.

H5: There is a significant positive relationship between algorithmic content exposure and social media addiction among youth in Pakistan.

H6: Excessive engagement with algorithmically curated social media content significantly increases emotional dependency among Pakistani youth.

H7: Awareness of digital literacy and healthy social media practices moderates the negative psychological effects of social media algorithms on youth.

Methodology

Research Design

This study adopted a mixed-methods research design to examine the impact of social media algorithms on the mental health of youth in Pakistan. The mixed-methods approach was selected because it enabled the researcher to obtain both quantitative and qualitative insights regarding the psychological and behavioral effects of algorithmically curated social media content. The quantitative component focused on measuring the relationship between social media algorithm exposure and mental health indicators, while the qualitative component explored participants' perceptions, experiences, and emotional responses toward algorithm-driven social media environments. An explanatory sequential design was employed in which quantitative data were collected and analyzed first, followed by qualitative interviews to further interpret and explain the quantitative findings.

Research Approach

The study utilized a pragmatic research approach that integrated both positivist and interpretivist perspectives. The quantitative phase followed a positivist approach to statistically examine relationships between variables such as algorithm exposure, anxiety, depression, self-esteem, and social media addiction. The qualitative phase adopted an interpretivist perspective to understand the subjective experiences and emotional interpretations of Pakistani youth regarding social media algorithms.

Population of the Study

The target population of the study consisted of Pakistani youth aged between 18 and 30 years who actively used social media platforms such as TikTok, Instagram, Facebook, Snapchat, and YouTube. The population included university students and young professionals from public and private universities located in major cities of Pakistan, including Karachi, Lahore, Islamabad, and Hyderabad. These individuals were selected because they represented the most active demographic group exposed to algorithmically personalized social media content.

Sample Size and Sampling Technique

For the quantitative phase, a sample size of 400 respondents was selected using Cochran's sample size formula to ensure statistical reliability and generalizability. A stratified random sampling technique was employed to ensure representation from different genders, educational backgrounds, and universities. The respondents were proportionally selected from public and private higher education institutions. For the qualitative phase, 20 participants were purposively selected from the quantitative sample for semi-structured interviews. Participants who demonstrated high levels of social media usage and significant experiences related to algorithmic content exposure were chosen to provide detailed and meaningful insights.

Data Collection Methods

Primary data were collected through two methods: structured questionnaires and semi-structured interviews.

Quantitative Data Collection

A structured questionnaire was developed based on previously validated scales from existing literature. The questionnaire consisted of two sections. The first section collected demographic information such as age, gender, education level, and frequency of social media usage. The second section measured variables including social media algorithm exposure, anxiety, depression, self-esteem, emotional dependency, and social media addiction using a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree.

The questionnaires were distributed online through Google Forms and physically among university students. Prior to the final survey, a pilot study involving 30 respondents was conducted to assess the reliability and clarity of the instrument.

Qualitative Data Collection

Semi-structured interviews were conducted to gain an in-depth understanding of participants' experiences with algorithmically curated social media content. The interviews focused on issues such as emotional reactions, social comparison, addictive usage behaviors, exposure to negative content, and coping mechanisms. Each interview lasted approximately 25–40 minutes and was conducted either face-to-face or through online meeting platforms. Participants' consent was obtained before recording and transcribing the interviews.

Measurement of Variables

The independent variable of the study was social media algorithm exposure, measured through indicators such as personalized recommendations, engagement-based content exposure, autoplay features, and repetitive content suggestions. The dependent variable was mental health, measured through dimensions including anxiety, depression, emotional well-being, self-esteem, and emotional dependency. Social media addiction was also measured as an associated behavioral outcome.

Validity and Reliability

To ensure content validity, the questionnaire items were adapted from established studies and reviewed by academic experts in media studies and psychology. Construct validity was assessed through factor analysis, while reliability was evaluated using Cronbach's Alpha coefficient. The reliability values for all constructs exceeded the acceptable threshold of 0.70, indicating satisfactory internal consistency.

Data Analysis Techniques

Quantitative data were analyzed using the Statistical Package for Social Sciences (SPSS) version 27. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize demographic information and variable characteristics. Inferential statistical techniques such as correlation analysis, regression analysis, and hypothesis testing were employed to examine the relationships between social media algorithms and mental health outcomes.

Qualitative data obtained from interviews were analyzed using thematic analysis. Interview transcripts were coded and categorized into themes related to emotional well-being, anxiety, social comparison, addiction, and algorithmic influence. The integration of quantitative and qualitative findings provided a comprehensive understanding of the research problem.

Ethical Considerations

The study strictly followed ethical research principles throughout the research process. Participants were informed about the purpose of the study, and informed consent was obtained prior to data collection. Participation was voluntary, and respondents were assured of confidentiality, anonymity, and the right to withdraw from the study at any stage. The collected data were used solely for academic purposes and stored securely to protect participants' privacy.

Data Analysis and Interpretation

Quantitative Data Analysis

The quantitative data collected from 400 respondents were analyzed using the Statistical Package for Social Sciences (SPSS) Version 27. Descriptive statistics, reliability analysis, correlation analysis, and regression analysis were

conducted to examine the relationship between social media algorithms and mental health among youth in Pakistan. The findings are presented below with detailed interpretation.

1. Demographic Profile of Respondents

Table 1:Demographic Characteristics of Respondents (N = 400)

Variable	Category	Frequency	Percentage (%)
Gender	Male	188	47.0
	Female	212	53.0
Age	18–22 Years	156	39.0
	23–26 Years	148	37.0
	27–30 Years	96	24.0
Education Level	Undergraduate	214	53.5
	Graduate	126	31.5
	Postgraduate	60	15.0
Daily Social Media Usage	1–3 Hours	82	20.5
	4–6 Hours	176	44.0
	More than 6 Hours	142	35.5

The demographic analysis indicated that female respondents constituted the majority of the sample with 53%, while males represented 47%. Most participants belonged to the age group of 18–22 years (39%), followed by 23–26 years (37%), indicating that the study primarily captured young adults actively engaged with social media platforms. Regarding education, undergraduate students formed the largest category with 53.5%, suggesting high social media exposure among university students. Furthermore, the results revealed that 44% of respondents spent 4–6 hours daily on social media, while 35.5% used social media for more than six hours per day. These findings demonstrate extensive digital engagement among Pakistani youth, increasing their exposure to algorithmically curated content.

2. Reliability Analysis

Table 2: Reliability Statistics

Variable	Number of Items	Cronbach's Alpha
Social Media Algorithm Exposure	6	0.861
Anxiety	5	0.843
Depression	5	0.826
Self-Esteem	5	0.804
Social Media Addiction	6	0.882
Emotional Dependency	5	0.834

Cronbach's Alpha values for all variables exceeded the acceptable threshold of 0.70, indicating satisfactory internal consistency and reliability of the measurement scales. The highest reliability value was observed for Social Media Addiction ($\alpha = 0.882$), followed by Social Media Algorithm Exposure ($\alpha = 0.861$). These results confirmed that the questionnaire items consistently measured the intended constructs and were suitable for further statistical analysis.

3. Descriptive Statistics

Table 3: Descriptive Statistics of Study Variables

Variable	Mean	Standard Deviation
Social Media Algorithm Exposure	4.12	0.71
Anxiety	3.94	0.76
Depression	3.81	0.73
Self-Esteem	2.68	0.81
Social Media Addiction	4.08	0.69
Emotional Dependency	3.89	0.75

The descriptive analysis showed that respondents reported high levels of exposure to social media algorithms (M = 4.12), indicating frequent interaction with personalized and algorithmically recommended content. Similarly, social media addiction recorded a high mean score (M = 4.08), suggesting strong dependency on social networking platforms among youth.

The findings also revealed elevated levels of anxiety (M = 3.94) and emotional dependency (M = 3.89), implying that excessive algorithmic exposure may contribute to emotional instability and psychological distress. Conversely, self-esteem reported a comparatively lower mean score (M = 2.68), indicating that prolonged exposure to idealized online content may negatively affect self-perception and confidence among respondents.

4. Correlation Analysis

Table 4: Correlation Matrix

Variables	1	2	3	4	5	6
1. Social Media Algorithm Exposure	1					
2. Anxiety	.691**	1				
3. Depression	.664**	.702**	1			
4. Self-Esteem	-.582**	-.611**	-.645**	1		
5. Social Media Addiction	.734**	.687**	.658**	-.566**	1	
6. Emotional Dependency	.712**	.695**	.671**	-.544**	.726**	1

Note: $p < 0.01$

The correlation analysis demonstrated a significant positive relationship between social media algorithm exposure and anxiety ($r = .691$, $p < 0.01$), depression ($r = .664$, $p < 0.01$), social media addiction ($r = .734$, $p < 0.01$), and emotional dependency ($r = .712$, $p < 0.01$). These findings indicate that increased interaction with algorithmically curated content is associated with greater psychological distress and addictive behaviors among Pakistani youth.

Additionally, a significant negative relationship was observed between social media algorithm exposure and self-esteem ($r = -.582$, $p < 0.01$), suggesting that continuous exposure to idealized online portrayals may reduce users' confidence and self-worth. Overall, the correlation findings strongly supported the proposed hypotheses of the study.

5. Regression Analysis

Table 5: Regression Analysis Results

Dependent Variable	Beta (β)	t-value	Sig.
Anxiety	0.691	14.872	0.000
Depression	0.664	13.991	0.000

Dependent Variable	Beta (β)	t-value	Sig.
Self-Esteem	-0.582	-11.446	0.000
Social Media Addiction	0.734	16.308	0.000
Emotional Dependency	0.712	15.201	0.000

The regression analysis confirmed that social media algorithm exposure significantly predicted mental health outcomes among Pakistani youth. The strongest positive effect was found on social media addiction ($\beta = 0.734$, $p < 0.001$), indicating that algorithmically personalized content substantially increased addictive usage behaviors.

Similarly, social media algorithm exposure positively influenced anxiety ($\beta = 0.691$, $p < 0.001$), depression ($\beta = 0.664$, $p < 0.001$), and emotional dependency ($\beta = 0.712$, $p < 0.001$). These results suggest that excessive engagement with algorithmically curated content contributed to emotional stress, depressive symptoms, and psychological dependency among respondents.

In contrast, the negative beta value for self-esteem ($\beta = -0.582$, $p < 0.001$) indicated that increased exposure to social media algorithms significantly reduced respondents' self-confidence and self-worth. Therefore, the regression findings validated the study's hypotheses and confirmed the substantial psychological influence of social media algorithms on youth in Pakistan.

6. Qualitative Data Analysis

The qualitative interviews were analyzed using thematic analysis. Several recurring themes emerged from participants' responses regarding their experiences with social media algorithms.

Theme 1: Continuous Exposure to Idealized Content

Most participants stated that algorithms repeatedly exposed them to highly curated lifestyles, beauty standards, luxury culture, and influencer content. Respondents reported feelings of inadequacy, inferiority, and dissatisfaction after prolonged exposure to such material.

Participant Response

"Every time I open Instagram or TikTok, I see perfect lifestyles and appearances. It makes me feel like my own life is not good enough."

Theme 2: Emotional Dependency and Addictive Usage

Participants explained that personalized recommendations and endless scrolling features encouraged compulsive social media usage. Many respondents admitted checking social media platforms repeatedly throughout the day even without specific reasons.

Participant Response

"The videos keep coming automatically, and I lose track of time. Sometimes I spend hours scrolling without realizing it."

Theme 3: Anxiety and Fear of Missing Out (FOMO)

Several participants reported anxiety when disconnected from social media or when unable to follow trending content and online interactions. Algorithm-driven trends and notifications intensified the fear of missing important social updates.

Participant Response

"If I stay offline for some time, I feel anxious that I might miss something important or trending."

Theme 4: Negative Impact on Self-Esteem

Many respondents indicated that constant comparison with influencers and peers negatively affected their confidence and body image. Female participants particularly highlighted pressure related to appearance standards promoted through social media algorithms.

Participant Response

"Social media makes people compare themselves constantly. It affects confidence, especially for girls."

Overall Interpretation of Findings

The overall findings demonstrated that social media algorithms significantly influenced the mental health and behavioral patterns of Pakistani youth. Both quantitative and

qualitative results consistently showed that algorithm-driven exposure increased anxiety, depression, emotional dependency, addictive usage behaviors, and reduced self-esteem among respondents. The findings further revealed that algorithmic personalization intensified social comparison, fear of missing out, and compulsive engagement with digital platforms.

The integration of quantitative statistics and qualitative experiences provided comprehensive evidence that social media algorithms have substantial psychological implications for youth in Pakistan. These findings emphasize the urgent need for digital literacy initiatives, mental health awareness programs, and responsible algorithmic practices to reduce the negative psychological effects associated with social media usage.

Discussion

The findings of this study revealed that social media algorithms significantly influence the mental health and behavioral patterns of youth in Pakistan. The quantitative results demonstrated strong positive relationships between algorithm-driven social media exposure and psychological outcomes such as anxiety, depression, emotional dependency, and social media addiction, while a negative relationship was observed with self-esteem. These findings support the assumptions of Social Comparison Theory, which explains that individuals evaluate themselves by comparing their lives, appearances, and achievements with others. Algorithmically curated social media feeds continuously expose youth to idealized lifestyles, beauty standards, achievements, and socially desirable content, thereby intensifying feelings of inadequacy, insecurity, and emotional distress.

The study found that algorithmic exposure strongly contributed to social media addiction among youth. Features such as autoplay videos, endless scrolling, personalized recommendations, and engagement-based notifications encouraged compulsive usage patterns and prolonged screen time. These findings align with previous studies that identified algorithmic systems as mechanisms specifically designed to maximize user engagement and retention. Pakistani youth, particularly university students and adolescents, appeared highly vulnerable to these persuasive digital designs because of increased online dependency for entertainment, social interaction, and emotional validation.

Furthermore, the results indicated that social media algorithms significantly increased anxiety and depressive symptoms among respondents. Participants reported experiencing emotional stress, fear of missing out (FOMO), social pressure, and emotional exhaustion due to constant exposure to algorithmically promoted content. Repetitive exposure to trending topics, idealized portrayals, and emotionally charged material created psychological pressure and unrealistic expectations. The qualitative findings also highlighted that participants frequently compared themselves with influencers and peers, leading to dissatisfaction with their personal lives, appearance, and achievements.

The negative relationship between algorithmic exposure and self-esteem was another critical finding of the study. Continuous exposure to highly filtered and curated online content reduced confidence and self-worth among participants, particularly female respondents who reported pressure related to beauty standards and social approval. This finding reflects the sociocultural realities of Pakistan, where societal expectations, gender norms, and online scrutiny further intensify emotional vulnerability among youth.

The qualitative findings enriched the quantitative results by providing deeper insight into participants' lived experiences. Respondents described algorithmically curated social media as emotionally addictive, psychologically exhausting, and socially influential. Many participants acknowledged losing track of time while scrolling through personalized feeds and reported emotional discomfort when disconnected from social media platforms. These experiences demonstrated how algorithms shape not only online behavior but also emotional well-being and social interaction patterns among youth.

Overall, the discussion suggests that social media algorithms have evolved beyond simple content delivery mechanisms and now function as influential psychological systems capable of shaping emotions, perceptions, habits, and mental health outcomes. The study therefore emphasizes the urgent need for awareness,

regulation, and intervention strategies to address the psychological risks associated with algorithm-driven social media environments in Pakistan.

Conclusion

This study examined the impact of social media algorithms on the mental health of youth in Pakistan using a mixed-methods research approach. The findings confirmed that algorithmically curated social media content significantly affects psychological well-being, emotional stability, and behavioral patterns among Pakistani youth. The quantitative analysis revealed strong positive relationships between social media algorithm exposure and anxiety, depression, emotional dependency, and addictive social media behaviors, while self-esteem was negatively affected.

The qualitative findings further demonstrated that personalized social media environments encourage compulsive usage, social comparison, emotional insecurity, and fear of missing out among youth. Participants described social media algorithms as highly engaging and emotionally influential systems that continuously expose users to unrealistic lifestyles, appearance standards, and socially competitive content. These experiences contributed to emotional stress, reduced confidence, and psychological dependency.

The study concluded that social media algorithms are not neutral technological systems but powerful behavioral and psychological tools that shape user emotions, interactions, and mental health outcomes. Pakistani youth, due to their developmental stage and extensive digital engagement, are particularly vulnerable to the negative psychological effects of algorithmically personalized content. Therefore, the study highlights the necessity for digital literacy, responsible algorithmic practices, mental health awareness, and policy interventions to promote healthier social media usage and protect youth well-being in Pakistan.

Implications of the Study

The study has significant theoretical, practical, and policy implications. Theoretically, the research contributes to the growing body of literature on digital mental health by extending Social Comparison Theory within the context of algorithm-driven social media environments. The study provides empirical evidence regarding how algorithmic personalization intensifies psychological outcomes such as anxiety, depression, addiction, and reduced self-esteem among youth.

Practically, the findings are important for educators, universities, parents, counselors, and mental health professionals. Educational institutions may utilize the findings to develop digital literacy programs and awareness campaigns regarding healthy social media practices. Mental health professionals and counselors may use the results to design intervention strategies aimed at reducing emotional dependency, anxiety, and addictive digital behaviors among adolescents and university students.

The study also has implications for policymakers and technology regulators in Pakistan. The findings highlight the need for regulatory frameworks that encourage ethical and transparent algorithmic practices among social media companies. Policymakers may use the study to formulate guidelines regarding youth protection, digital well-being, online safety, and responsible platform design. Additionally, social media companies may benefit from implementing algorithmic adjustments that prioritize user well-being rather than solely maximizing engagement and screen time.

Future Directions

Future studies may expand this research by investigating the long-term psychological effects of social media algorithms on different demographic groups across Pakistan. Longitudinal studies would provide deeper understanding of how continuous algorithmic exposure influences mental health over extended periods. Future researchers may also compare the effects of different social media platforms such as TikTok, Instagram, Facebook, and YouTube to determine which algorithmic environments have the greatest psychological impact.

Additionally, future research may examine moderating variables such as gender, socioeconomic status, personality traits, emotional intelligence, and digital literacy in understanding algorithmic effects on mental health. Comparative cross-cultural studies between Pakistan and other countries may also

provide broader insight into the sociocultural dimensions of algorithm-driven social media experiences.

Further qualitative investigations may explore specific psychological experiences related to cyberbullying, body image concerns, online validation, and emotional resilience. Researchers may also investigate the effectiveness of digital detox programs, mental health interventions, and algorithm-awareness education in reducing the negative psychological consequences of social media usage among youth.

Recommendations

Based on the findings of the study, several recommendations are proposed to minimize the negative psychological effects of social media algorithms among youth in Pakistan.

First, educational institutions should introduce digital literacy and mental health awareness programs that educate students about algorithmic manipulation, social comparison, emotional dependency, and healthy online behaviors. Universities and schools should encourage balanced technology usage and promote offline social interaction and physical activities.

Second, parents and guardians should actively monitor and guide young individuals regarding responsible social media usage. Open communication regarding online experiences, emotional well-being, and digital habits may help reduce excessive dependency on social networking platforms.

Third, mental health professionals and counselors should develop targeted counseling services and intervention programs addressing anxiety, depression, addiction, and emotional stress associated with social media use. Awareness campaigns regarding the psychological impact of algorithmically curated content should also be promoted at institutional and community levels.

Fourth, policymakers and regulatory authorities in Pakistan should establish digital well-being policies and encourage social media companies to adopt ethical algorithmic practices. Technology platforms should increase transparency regarding recommendation systems and implement features that promote healthier user engagement rather than addictive usage behaviors.

Finally, youth themselves should be encouraged to practice self-regulation strategies such as limiting screen time, reducing exposure to harmful content, engaging in digital detox activities, and developing awareness regarding unrealistic portrayals on social media platforms.

Limitations of the Study

Despite its significant contributions, the study had several limitations. First, the study focused primarily on youth aged 18–30 years from selected universities and urban regions of Pakistan, which may limit the generalizability of the findings to other age groups or rural populations. Future studies may include more diverse demographic groups and geographical regions for broader representation.

Second, the study relied heavily on self-reported data collected through questionnaires and interviews. Respondents may have provided socially desirable responses or may not have accurately reported their emotional experiences and social media behaviors. This limitation could affect the precision of the findings.

Third, the cross-sectional nature of the quantitative component restricted the ability to establish long-term causal relationships between social media algorithm exposure and mental health outcomes. Longitudinal studies are therefore recommended to examine changes in psychological well-being over time.

Fourth, the study mainly examined general social media algorithm exposure rather than analyzing specific platform algorithms individually. Different platforms may utilize distinct recommendation systems that affect users differently. Future research may conduct platform-specific investigations for more detailed analysis.

Lastly, the study focused primarily on negative psychological effects and did not extensively explore the potential positive impacts of social media algorithms, such as educational access, social support, creativity, and professional networking opportunities. Future studies may adopt a more balanced approach by examining both positive and negative dimensions of algorithm-driven social media usage.

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