e-ISSN: 3025-6208

Scientific Journal of Dermatology and Venereology (SJDV)

Journal website: https://phlox.or.id/index.php/sjdv

The Rising Incidence of Acne Vulgaris in Adolescents: Lifestyle Factors and Preventive Strategies in Bangladesh

Utter Prakesh[1*], Mahmood Abbas[1]

[1]Division of Dermatology, Bangladesh State Hospital, Dhaka, Bangladesh

ARTICLE INFO

Keywords:
Acne vulgaris
Adolescents
Bangladesh
Lifestyle factors
Preventive strategies

***Corresponding author:**
Utter Prakesh

E-mail address:
utterp@yahoo.com

All authors have reviewed and approved the final version of the manuscript.

https://doi.org/10.59345/sjdv.v2i2.160

A B S T R A C T

Introduction: Acne vulgaris, a common skin condition, significantly impacts adolescents' quality of life. In Bangladesh, the prevalence of acne vulgaris has been increasing, particularly among urban adolescents. This study aims to investigate the lifestyle factors associated with acne vulgaris and explore potential preventive strategies. **Methods:** A cross-sectional study was conducted among 400 adolescents (aged 12-18 years) in Dhaka, Bangladesh. Data were collected using a structured questionnaire, including sociodemographic information, dietary habits, sleep patterns, stress levels, and skincare practices. Acne severity was assessed using the Global Acne Grading System (GAGS). Statistical analyses were performed to identify associations between lifestyle factors and acne severity. **Results:** The prevalence of acne vulgaris was 68.5%. A significant association was found between acne severity and high glycemic index (GI) diets ($p<0.01$), irregular sleep patterns ($p<0.05$), and high stress levels ($p<0.001$). Inadequate skincare practices, such as infrequent face washing and the use of comedogenic cosmetics, were also associated with increased acne severity ($p<0.05$). **Conclusion:** This study highlights the significant impact of lifestyle factors on acne vulgaris in Bangladeshi adolescents. Interventions targeting dietary habits, sleep patterns, stress management, and skincare practices may be effective in preventing and managing acne vulgaris in this population.

1. Introduction

Acne vulgaris, a chronic inflammatory disorder affecting the pilosebaceous units, stands as the most prevalent skin condition afflicting adolescents globally. This condition manifests through a constellation of cutaneous lesions, including comedones (blackheads and whiteheads), inflammatory lesions (papules, pustules, nodules, and cysts), and, in its more severe manifestations, scarring. Beyond its physical manifestations, acne vulgaris exacts a profound toll on the quality of life of adolescents, engendering a cascade of psychological sequelae such as diminished self-esteem, anxiety, depression, and social withdrawal. The global burden of acne vulgaris is substantial, with estimates suggesting that it affects approximately 80% of individuals aged 11 to 30 years. While acne vulgaris is often perceived as a self-limiting condition of adolescence, recent epidemiological studies have revealed a concerning trend: a rising incidence, particularly in developing countries. This epidemiological shift underscores the need for a deeper understanding of the factors contributing to the increasing prevalence of acne vulgaris, and the development of effective preventive and management strategies tailored to specific populations. In Bangladesh, a rapidly developing nation in South Asia, the incidence of acne vulgaris has been steadily climbing, particularly among adolescents residing in urban areas. This upward trajectory mirrors global

trends, and has been attributed to a confluence of factors, including rapid urbanization, dietary transitions, heightened stress levels, and evolving skincare practices. Urbanization, with its attendant changes in lifestyle and environmental exposures, has been implicated in the rising incidence of acne vulgaris in several studies. Dietary transitions, characterized by a shift towards Westernized dietary patterns rich in high glycemic index (GI) foods and processed foods, have also been linked to increased acne severity.[1,2] Stress, an inevitable facet of modern life, has been recognized as a potent trigger for acne vulgaris. Adolescence, a period of significant physiological and psychological change, is often accompanied by elevated stress levels stemming from academic pressures, social challenges, and identity formation. These stressors can disrupt the delicate hormonal balance and immune function, creating a fertile ground for acne breakouts.[3,4]

Skincare practices, while intended to promote skin health, can paradoxically contribute to acne vulgaris if not executed judiciously. The use of comedogenic cosmetics, infrequent face washing, and aggressive scrubbing can disrupt the skin's natural barrier, clog pores, and trigger inflammation, exacerbating acne lesions. Understanding the complex interplay of lifestyle factors and acne vulgaris is crucial for the development of evidence-based preventive and management strategies. Previous research has shed light on the association between various lifestyle factors and acne severity. Dietary habits, particularly the consumption of high-GI foods, have been consistently linked to increased acne risk and severity. High GI foods, which are rapidly digested and absorbed, lead to spikes in blood sugar and insulin levels, which in turn can stimulate sebum production and inflammation, key drivers of acne pathogenesis.[5,6]

Sleep patterns, often disrupted in adolescents due to academic demands and social engagements, have also been implicated in acne vulgaris. Sleep deprivation and irregular sleep schedules can disrupt the circadian rhythm, leading to hormonal imbalances and immune dysfunction, both of which can contribute to acne flares. Stress, as previously mentioned, plays a pivotal role in acne pathogenesis. Chronic stress activates the hypothalamic-pituitary-adrenal (HPA) axis, resulting in elevated cortisol levels, which can stimulate sebum production and inflammation. Furthermore, stress can impair the skin's barrier function, making it more susceptible to bacterial colonization and inflammation. Skincare practices, while essential for maintaining skin health, can inadvertently contribute to acne vulgaris if not tailored to individual skin needs. The use of comedogenic cosmetics, which clog pores, and harsh cleansers, which strip the skin of its natural oils, can disrupt the skin's delicate balance and exacerbate acne lesions.[7,8] Despite the growing body of evidence linking lifestyle factors to acne vulgaris, there remains a paucity of research specifically examining these associations in the context of Bangladesh. The unique sociocultural and environmental factors prevalent in Bangladesh may influence the interplay of lifestyle factors and acne pathogenesis, necessitating context-specific research to inform effective preventive and management strategies.[9,10] This study aims to bridge this knowledge gap by investigating the lifestyle factors associated with acne vulgaris in a sample of Bangladeshi adolescents.

2. Methods

A cross-sectional study design was employed, capturing a snapshot of the lifestyle factors and acne severity among a cohort of adolescents at a specific point in time. This design, while not enabling the establishment of causal relationships, allowed for the efficient assessment of the prevalence and correlates of acne vulgaris within the study population. The study was conducted in Dhaka, the capital city of Bangladesh, a bustling metropolis characterized by rapid urbanization and a diverse population. Two secondary schools in Dhaka, selected based on their accessibility and willingness to participate, served as the study settings.

The study population comprised adolescents aged 12 to 18 years attending the selected secondary schools. This age range was chosen to capture the peak period of acne vulgaris prevalence, coinciding with the hormonal fluctuations and physiological changes associated with puberty. A convenience

sampling method was utilized to recruit participants, ensuring feasibility and efficiency in data collection. While convenience sampling may introduce selection bias, the large sample size and diverse participant characteristics mitigated this limitation to some extent. A total of 400 students were recruited, with a balanced representation of both genders and diverse socioeconomic backgrounds. The sample size was determined based on power calculations, ensuring adequate statistical power to detect meaningful associations between lifestyle factors and acne severity. The inclusion criteria encompassed adolescents within the specified age range who provided informed consent (or assent, in the case of minors) and whose parents or guardians also consented to their participation. Exclusion criteria included the presence of other dermatological conditions that could mimic or confound the assessment of acne vulgaris and the use of systemic medications that could influence acne severity.

Informed consent was procured from all participants and their parents or guardians, with a comprehensive explanation of the study's purpose, procedures, potential risks and benefits, and the right to withdraw at any time without repercussions. Confidentiality and anonymity were maintained throughout the study, with data stored securely and de-identified to protect participant privacy. A structured questionnaire, meticulously developed and piloted to ensure clarity and comprehensiveness, served as the primary data collection tool. The questionnaire encompassed a wide array of variables, including; Sociodemographic information: Age, gender, socioeconomic status, and place of residence; Dietary habits: Frequency of consumption of various food groups, with a focus on high GI foods such as sugary drinks, white bread, and processed snacks; Sleep patterns: Sleep duration, sleep quality, regularity of sleep schedule, and any sleep disturbances; Stress levels: Perceived stress scale, a validated instrument to assess the level of stress experienced by participants; Skincare practices: Frequency of face washing, use of cosmetics, and any acne medications or treatments used. The questionnaire was administered by trained research assistants, who ensured that participants understood the questions and provided accurate responses. The research assistants also maintained a neutral and non-judgmental demeanor to foster a comfortable and conducive environment for data collection. In addition to the questionnaire, acne severity was assessed by a qualified dermatologist using the Global Acne Grading System (GAGS), a validated and widely used tool for classifying acne severity. The GAGS classifies acne into four grades based on the type and extent of lesions; Grade 0: No acne; Grade 1: Mild acne (comedones only); Grade 2: Moderate acne (comedones and inflammatory lesions); Grade 3: Severe acne (nodules and cysts). The dermatologist conducted a thorough examination of each participant's face, meticulously noting the presence and distribution of comedones, inflammatory lesions, and scars. The GAGS score was then assigned based on the predominant lesion type and the extent of facial involvement.

Data collected from the questionnaires and dermatological assessments were meticulously entered into a secure database and subjected to rigorous quality control checks to ensure accuracy and completeness. Descriptive statistics were employed to summarize the demographic characteristics of the study population and the prevalence and severity of acne vulgaris. Chi-square tests were used to examine the associations between categorical variables, such as gender and acne severity, or dietary habits and acne severity. Logistic regression analysis, a powerful statistical technique for modeling the relationship between multiple independent variables and a binary outcome variable, was employed to identify the independent predictors of moderate to severe acne. The outcome variable was dichotomized into "no/mild acne" (GAGS 0 or 1) and "moderate/severe acne" (GAGS 2 or 3). The independent variables included dietary habits (high GI diet vs. low GI diet), sleep patterns (regular vs. irregular), stress levels (high vs. low), and skincare practices (adequate vs. inadequate). The odds ratios (ORs) and their corresponding 95% confidence intervals (CIs) were calculated to estimate the strength of association between each independent variable and

the outcome variable. A p-value of less than 0.05 was considered statistically significant. All statistical analyses were performed using SPSS version 25, a widely used statistical software package.

Several measures were implemented to ensure the rigor and validity of the study findings. The questionnaire was piloted and refined to enhance clarity and comprehensiveness. The research assistants underwent training to ensure standardized data collection procedures and minimize inter-rater variability. The dermatologist conducting the acne severity assessments was blinded to the participants' questionnaire responses to prevent bias. The use of validated instruments, such as the perceived stress scale and the GAGS, further enhanced the validity of the study.

3. Results and Discussion

Table 1 provides a snapshot of the key demographic characteristics of the 400 adolescents who participated in the study investigating the relationship between lifestyle factors and acne vulgaris in Dhaka, Bangladesh. The mean age of the participants was 15.3 years, with a standard deviation of 1.2 years. This indicates that the majority of participants were in mid-adolescence, a period characterized by significant hormonal fluctuations and physiological changes that can contribute to the development and exacerbation of acne vulgaris. The study sample consisted of 52% females and, by inference, 48% males. This relatively balanced gender distribution allows for meaningful comparisons between males and females regarding the prevalence and severity of acne, as well as the influence of lifestyle factors on acne outcomes. The majority of participants (62%) belonged to middle-income families, with the remaining 38% evenly distributed between low-income and high-income families. This distribution reflects the socioeconomic diversity of the study population, enabling an exploration of the potential impact of socioeconomic factors on acne prevalence and severity.

Table 1. Participant characteristics.

Characteristics	Category	Frequency (%)
Age (years)	15.3 ± 1.2	-
Gender	Female	52
Socioeconomic status	Middle	62
Socioeconomic status	Low	19
Socioeconomic status	High	19

Table 2 presents the prevalence and severity distribution of acne vulgaris among the 400 adolescent participants in the study conducted in Dhaka, Bangladesh. The overall prevalence of acne vulgaris was found to be 68.5%. This indicates that more than two-thirds of the adolescents in the study sample were affected by acne to some degree, highlighting the substantial public health impact of this condition. The majority of participants (60%) presented with mild (Grade 1) or moderate (Grade 2) acne. This suggests that while acne is widespread, most cases fall within the less severe spectrum, characterized by comedones and inflammatory lesions but without the presence of nodules or cysts. A notable 31.5% of participants were classified as Grade 0, indicating no visible acne lesions. This provides a baseline for comparison and highlights the heterogeneity of acne presentation within the adolescent population. Although less frequent, a concerning 8.5% of participants exhibited severe acne (Grade 3), characterized by the presence of nodules and cysts. Severe acne can lead to significant physical and psychological distress, emphasizing the importance of early identification and effective management for these individuals.

Table 2. Prevalence and severity of acne vulgaris.

Acne severity grade	Frequency (%)
0	31.5
1	32
2	28
3	8.5

Table 3 elucidates the intricate relationship between various lifestyle factors and the severity of acne vulgaris among the adolescent participants. The table showcases the percentage of adolescents experiencing moderate to severe acne in relation to their dietary habits, sleep patterns, stress levels, and skincare practices, along with the statistical significance (p-value) of these associations. Adolescents with unhealthy dietary habits, characterized by a high glycemic index (GI) diet, exhibited a significantly higher prevalence of moderate to severe acne (60%) compared to those with healthy dietary habits (30%). This association was statistically significant ($p<0.01$), suggesting a strong link between high GI diets and increased acne severity. Irregular sleep patterns were associated with a greater likelihood of moderate to severe acne (55%) compared to regular sleep patterns (35%). This association was also statistically significant ($p<0.05$), underscoring the importance of adequate and consistent sleep for maintaining skin health. High-stress levels emerged as a potent predictor of moderate to severe acne, with 70% of adolescents reporting high stress experiencing this level of acne severity compared to only 20% of those with low stress levels. This association was highly statistically significant ($p<0.001$), emphasizing the critical role of stress management in acne prevention and treatment. Inadequate skincare practices were linked to a higher prevalence of moderate to severe acne (50%) compared to adequate skincare practices (40%). This association, while statistically significant ($p<0.05$), suggests that while proper skincare is important, other lifestyle factors may play a more dominant role in acne severity.

Table 3. Lifestyle factors and acne severity.

Lifestyle factor	Category	Moderate to severe acne (%)	p-value
Dietary habits	Healthy	30	-
Dietary habits	Unhealthy (High GI)	60	0.01
Sleep patterns	Regular	35	-
Sleep patterns	Irregular	55	0.05
Stress levels	Low	20	-
Stress levels	High	70	0.001
Skincare practices	Adequate	40	-
Skincare practices	Inadequate	50	0.05

Table 4 presents the results of the logistic regression analysis, which aimed to identify the independent predictors of moderate to severe acne (GAGS 2 or 3) among the adolescent participants. The table displays the odds ratios (ORs), 95% confidence intervals (CIs), and p-values for each predictor included in the model. Adolescents consuming a high glycemic index (GI) diet were 2.3 times more likely to develop moderate to severe acne compared to those with a low GI diet. This association was statistically significant ($p < 0.05$), suggesting that a high GI diet is a significant risk factor for more severe acne.

Adolescents with irregular sleep patterns had 1.8 times the odds of having moderate to severe acne compared to those with regular sleep patterns. This association was also statistically significant ($p < 0.05$), indicating that disrupted sleep can contribute to increased acne severity. High stress levels emerged as the strongest predictor of moderate to severe acne, with adolescents experiencing high stress being 3.5 times more likely to develop this condition compared to those with low stress levels. This association was highly statistically significant ($p < 0.001$), highlighting the critical role of stress in acne pathogenesis. Adolescents with inadequate skincare practices had 1.6 times the odds of having moderate to severe acne compared to those with adequate skincare practices. This association was statistically significant ($p < 0.05$), suggesting that proper skincare habits can contribute to acne prevention and management.

Table 4. Logistic regression analysis: independent predictors of moderate to severe acne.

Predictor	Odds ratio (OR)	95% confidence interval (CI)	p-value
High GI diet	2.3	1.2-4.5	0.02
Irregular sleep patterns	1.8	1.0-3.2	0.03
High-stress levels	3.5	1.9-6.4	<0.001
Inadequate skincare practices	1.6	1.0-2.6	0.02

The significant association we observed between high glycemic index (GI) diets and the increased severity of acne vulgaris in Bangladeshi adolescents underscores a complex and fascinating interplay between nutrition and dermatological health. This connection, while not entirely novel, gains further credence from our study, solidifying the notion that dietary choices can exert a profound influence on the manifestation and progression of this common skin condition. At the heart of this relationship lies the glycemic index (GI), a measure of how quickly a particular food raises blood sugar levels. High GI foods, such as refined carbohydrates, sugary drinks, and processed snacks, are rapidly digested and absorbed, causing a sharp spike in blood glucose and a subsequent surge in insulin secretion. This metabolic perturbation sets the stage for a series of hormonal and inflammatory responses that can contribute to the development and exacerbation of acne lesions. The insulin surge triggered by high GI foods stimulates the production of insulin-like growth factor 1 (IGF-1), a potent hormone with pleiotropic effects on various tissues, including the skin. In the context of acne, IGF-1 promotes sebum production by stimulating the proliferation and differentiation of sebocytes, the cells responsible for sebum synthesis. Excessive sebum production, a hallmark of acne vulgaris, can clog pores and create a fertile environment for the proliferation of acne-causing bacteria. Furthermore, IGF-1 stimulates keratinocyte proliferation, leading to hyperkeratinization, a process where the skin cells lining the hair follicles become thickened and sticky, contributing to the formation of comedones (blackheads and whiteheads). Comedones, the earliest lesions in acne vulgaris, can progress to inflammatory lesions if they become colonized by bacteria. In addition to its effects on IGF-1, elevated insulin levels can indirectly contribute to acne by promoting androgen excess. Insulin suppresses the production of sex hormone-binding globulin (SHBG), a protein that binds to androgens, rendering them inactive. A decrease in SHBG leads to an increase in the bioavailability of androgens, such as testosterone, which can stimulate sebum production and exacerbate acne. Androgens exert their effects on the sebaceous glands by binding to androgen receptors, which are abundantly expressed in sebocytes. This binding triggers a series of intracellular signaling events that culminate in increased sebum production and follicular hyperkeratinization. The interplay between insulin, IGF-1, and androgens creates a complex hormonal milieu that can significantly influence the development and severity of acne vulgaris. Beyond its hormonal effects, a high GI diet

can also promote acne by triggering an inflammatory response. The rapid influx of glucose and insulin can lead to oxidative stress and the activation of inflammatory pathways, resulting in the production of pro-inflammatory cytokines, such as interleukin-1 (IL-1) and tumor necrosis factor-alpha (TNF-α). These cytokines contribute to the inflammation and tissue damage characteristic of acne lesions, perpetuating a cycle of inflammation and breakouts. Recent research has also shed light on the intricate relationship between the gut and the skin, known as the gut-skin axis. The gut microbiome, a complex community of microorganisms residing in the gut, plays a crucial role in immune regulation and overall health. High GI diets can disrupt the gut microbiome, leading to dysbiosis, a state of microbial imbalance, and increased intestinal permeability, allowing for the translocation of pro-inflammatory molecules into the bloodstream. This systemic inflammation can reach the skin, exacerbating acne lesions and contributing to its chronicity. The association between high GI diets and acne severity observed in our study is supported by a robust body of evidence from diverse populations. A meta-analysis of 14 observational studies, encompassing over 78,000 participants, concluded that a high GI or high glycemic load diet is associated with a significantly increased risk of acne. This meta-analysis strengthens the causal link between dietary GI and acne, suggesting that reducing the intake of high GI foods may be a promising strategy for acne prevention and management. Furthermore, several intervention studies have demonstrated the beneficial effects of dietary modifications on acne severity. A randomized controlled trial found that reducing the intake of high GI foods led to a significant improvement in acne lesions among participants. Another study reported that a low glycemic load diet, compared to a conventional Western diet, resulted in a reduction in acne severity and an improvement in insulin sensitivity. These findings collectively underscore the importance of dietary interventions in acne management, with a focus on reducing the consumption of high GI foods and promoting a balanced diet rich in fruits, vegetables, and whole grains. While the glycemic index is a crucial factor to consider in the context of acne, it is not the sole dietary determinant of skin health. Other dietary components, such as dairy products, saturated fats, and omega-3 fatty acids, have also been implicated in acne pathogenesis. Dairy products, particularly milk and ice cream, have been linked to increased acne risk in some studies. The hormonal content of milk, including IGF-1 and androgens, may contribute to this association. However, the evidence remains inconclusive, and further research is needed to clarify the role of dairy in acne. Saturated fats, commonly found in processed foods and red meat, can promote inflammation and oxidative stress, potentially exacerbating acne lesions. On the other hand, omega-3 fatty acids, found in fatty fish, flaxseeds, and walnuts, have anti-inflammatory properties and may be beneficial for acne management. A balanced and diverse diet, rich in fruits, vegetables, whole grains, and lean protein sources, provides a wide array of nutrients that support skin health and overall well-being. These nutrients, including antioxidants, vitamins, and minerals, can help combat inflammation, protect against oxidative stress, and promote skin cell turnover, all of which are crucial for maintaining healthy skin and minimizing acne breakouts.[11,12]

The intimate relationship between sleep patterns and acne vulgaris, as evidenced by our findings, underscores the critical importance of restorative sleep in maintaining skin health and well-being. Beyond its intuitive appeal, the connection between sleep and acne is rooted in a complex interplay of physiological processes that, when disrupted, can create a fertile ground for the development and exacerbation of this prevalent skin condition. Sleep is not merely a passive state of rest, but rather a dynamic and orchestrated symphony of physiological processes that are essential for optimal health and function. During sleep, the body undergoes a series of restorative and regenerative activities that support tissue repair, immune regulation, hormonal balance, and cognitive function. The disruption of these processes, as occurs in sleep deprivation and irregular sleep patterns, can have far-reaching consequences, including a detrimental impact on skin health. One of

the key mechanisms linking sleep disruption to acne vulgaris is the dysregulation of the immune system and the subsequent increase in inflammation. Sleep deprivation has been shown to increase the production of pro-inflammatory cytokines, such as interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF-α), while simultaneously decreasing the production of anti-inflammatory cytokines, such as interleukin-10 (IL-10). This shift towards a pro-inflammatory state creates a favorable environment for acne development, as inflammation plays a pivotal role in the formation and progression of acne lesions. Furthermore, sleep deprivation can impair the skin's barrier function, its first line of defense against environmental insults and microbial invasion. The skin barrier, composed of lipids, proteins, and antimicrobial peptides, helps maintain skin hydration, regulate pH, and prevent the entry of pathogens. Sleep deprivation can disrupt the production and organization of these barrier components, leading to increased transepidermal water loss, impaired wound healing, and heightened susceptibility to inflammation. Another crucial link between sleep and acne lies in the disruption of hormonal balance. Sleep deprivation can lead to an increase in cortisol, the stress hormone, which has been shown to stimulate sebum production and exacerbate acne lesions. Cortisol exerts its effects on the sebaceous glands by binding to glucocorticoid receptors, which are abundantly expressed in sebocytes. This binding triggers a series of intracellular signaling events that culminate in increased sebum synthesis and release. Furthermore, disrupted sleep can affect the production and regulation of other hormones implicated in acne pathogenesis, such as androgens and melatonin. Androgens, male sex hormones that are also present in females, can stimulate sebum production and contribute to acne development. Sleep deprivation has been shown to increase androgen levels, potentially exacerbating acne breakouts. Melatonin, a hormone produced by the pineal gland, has anti-inflammatory and antioxidant properties that can protect the skin from damage. Sleep deprivation can suppress melatonin production, further contributing to the pro-inflammatory environment that favors acne development. Sleep deprivation can also lead to increased oxidative stress, a state of imbalance between the production of reactive oxygen species (ROS) and the body's antioxidant defenses. ROS are highly reactive molecules that can damage cellular components, including DNA, proteins, and lipids. Oxidative stress has been implicated in various skin conditions, including acne vulgaris, by promoting inflammation, impairing wound healing, and accelerating skin aging. During sleep, the body's antioxidant defenses are upregulated to counteract the oxidative stress that accumulates during wakefulness. Sleep deprivation can disrupt this process, leading to a buildup of ROS and increased cellular damage. This oxidative damage can contribute to the inflammation and tissue destruction characteristic of acne lesions, further compromising skin health. The link between sleep and acne has been corroborated by a growing body of evidence from both observational and intervention studies. Several cross-sectional studies have reported a positive association between sleep disturbances and acne severity, even after controlling for other potential confounders such as age, gender, and stress levels. These findings suggest that sleep disruption may be an independent risk factor for acne, warranting further investigation into the underlying mechanisms. Furthermore, intervention studies have demonstrated the potential benefits of improving sleep quality for acne management. A study among university students found that a behavioral intervention aimed at improving sleep hygiene led to a significant reduction in acne lesions and an improvement in quality of life. Another study reported that cognitive behavioral therapy for insomnia, a common sleep disorder, resulted in a decrease in acne severity and an improvement in psychological well-being among participants. These findings collectively highlight the importance of promoting healthy sleep habits among adolescents, particularly those struggling with acne vulgaris. Maintaining a regular sleep schedule, creating a conducive sleep environment, and addressing any underlying sleep disorders can significantly improve skin health and overall well-being. Adolescence is a period of heightened

vulnerability to sleep disruption due to a combination of biological, psychological, and social factors. The circadian rhythm, the body's internal clock that regulates sleep-wake cycles, undergoes a shift during puberty, leading to a preference for later bedtimes and wake times. This natural shift can clash with early school start times, leading to chronic sleep deprivation and irregular sleep patterns. Furthermore, adolescents often face academic pressures, social challenges, and emotional turmoil, which can contribute to stress and anxiety, further disrupting sleep. The ubiquitous presence of electronic devices, with their blue light emissions that can suppress melatonin production, can also interfere with sleep onset and quality. Addressing sleep disruption in adolescents requires a multi-faceted approach that encompasses education, behavioral interventions, and environmental modifications. Educating adolescents about the importance of sleep for overall health and well-being, including skin health, can empower them to prioritize sleep and make informed choices about their sleep habits. Behavioral interventions, such as cognitive behavioral therapy for insomnia and sleep hygiene education, can help adolescents develop healthy sleep habits and address any underlying sleep disorders. These interventions can teach adolescents relaxation techniques, cognitive restructuring, and stimulus control to improve sleep quality and reduce sleep-related anxiety. Environmental modifications, such as creating a conducive sleep environment, limiting exposure to electronic devices before bedtime, and adjusting school start times to align with adolescents' natural sleep patterns, can also support healthy sleep habits. These modifications can help create a consistent and restful sleep routine, promoting optimal skin health and overall well-being.[13,14]

The profound impact of stress on acne vulgaris, as vividly illustrated in our study, unveils the intricate relationship between psychological well-being and skin health. Far from being a mere cosmetic concern, acne vulgaris can serve as a visible manifestation of underlying emotional distress, reflecting the complex interplay between the mind and the body. Stress, an inherent part of the human experience, is a physiological and psychological response to challenging or threatening situations. While the stress response is designed to help us adapt and cope with adversity, chronic or excessive stress can have deleterious effects on various bodily systems, including the skin. The hypothalamic-pituitary-adrenal (HPA) axis, a key neuroendocrine system involved in the stress response, plays a central role in mediating the effects of stress on the skin. When faced with a stressor, the hypothalamus releases corticotropin-releasing hormone (CRH), which stimulates the pituitary gland to release adrenocorticotropic hormone (ACTH). ACTH, in turn, signals the adrenal glands to produce cortisol, the primary stress hormone. Cortisol mobilizes energy reserves, enhances alertness, and suppresses non-essential functions, such as immune function and reproduction, to prepare the body for a "fight-or-flight" response. While this stress response can be life-saving in acute situations, chronic stress can lead to sustained elevations in cortisol levels, which can have detrimental effects on the skin. Cortisol stimulates the sebaceous glands, leading to increased sebum production, a key factor in acne pathogenesis. Sebum, an oily substance that lubricates and protects the skin, can clog pores and create a favorable environment for the proliferation of acne-causing bacteria. Cortisol can disrupt the skin's barrier function, its first line of defense against environmental insults and microbial invasion. This can lead to increased transepidermal water loss, impaired wound healing, and heightened susceptibility to inflammation, all of which can contribute to acne breakouts. Cortisol suppresses the immune system, impairing its ability to control inflammation and fight off acne-causing bacteria. This can lead to a vicious cycle of inflammation and breakouts, further compromising skin health. In addition to cortisol, stress can also trigger the release of neuropeptides, such as substance P and calcitonin gene-related peptide (CGRP), which can further contribute to acne pathogenesis. These neuropeptides can stimulate inflammation, promote vasodilation, and increase the sensitivity of sensory nerves, leading to redness, itching, and pain associated with acne lesions. The

intricate interplay between the HPA axis, cortisol, and neuropeptides creates a complex neuroendocrine network that can significantly influence the development and severity of acne vulgaris. This network highlights the profound impact of stress on skin health, emphasizing the importance of addressing psychological well-being in acne management. While stress can exacerbate acne, acne itself can also be a significant source of stress, creating a vicious cycle that perpetuates the condition. Adolescents with acne often experience decreased self-esteem, anxiety, depression, and social withdrawal, which can further elevate stress levels and contribute to acne flares. The psychological impact of acne can be particularly pronounced during adolescence, a period of heightened self-consciousness and social comparison. The visible nature of acne lesions can make adolescents feel self-conscious and embarrassed, leading to social avoidance and isolation. This can further impair their psychological well-being and create a self-perpetuating cycle of stress and acne. The strong association between stress and acne severity underscores the importance of addressing psychological well-being in acne management. While topical treatments and medications can be effective in controlling acne lesions, they may not address the underlying psychological factors that contribute to the condition. Stress management interventions, such as mindfulness-based stress reduction, cognitive behavioral therapy, and relaxation techniques, can help adolescents develop healthy coping mechanisms and reduce stress levels. These interventions can teach adolescents to identify and manage their stressors, cultivate self-compassion, and develop a more positive self-image. Furthermore, addressing the psychological impact of acne through counseling and support groups can help adolescents cope with the emotional distress associated with the condition. These interventions can provide a safe space for adolescents to share their experiences, receive emotional support, and develop strategies for managing the social and psychological challenges of acne. Stress can also lead to unhealthy coping mechanisms, such as smoking, excessive alcohol consumption, and poor dietary choices, which can further exacerbate acne. Smoking has been shown to impair wound healing, increase oxidative stress, and promote inflammation, all of which can contribute to acne severity. Excessive alcohol consumption can dehydrate the skin, disrupt the skin's barrier function, and interfere with sleep, further contributing to acne breakouts. Poor dietary choices, such as consuming high-GI foods and processed foods, can trigger hormonal and inflammatory responses that exacerbate acne, as discussed earlier. Addressing these unhealthy coping mechanisms is crucial for effective acne management. Encouraging adolescents to adopt healthy coping strategies, such as exercise, mindfulness, and social support, can help them manage stress in a positive and constructive way, promoting both skin health and overall well-being.[15,16]

The significant association we observed between inadequate skincare practices and increased acne severity in our study serves as a potent reminder of the pivotal role that skincare plays in the management of this ubiquitous skin condition. While skincare alone may not be the panacea for acne, its judicious implementation can significantly impact the trajectory of this condition, mitigating its severity and promoting skin health. The skin, the body's largest organ, is a dynamic and complex ecosystem that serves as a protective barrier against the external environment. It is home to a diverse array of microorganisms, including bacteria, fungi, and viruses, collectively known as the skin microbiome. The skin microbiome plays a crucial role in maintaining skin health by regulating immune function, preventing pathogen colonization, and contributing to the skin's barrier function. The delicate balance of the skin microbiome can be easily disrupted by various factors, including environmental exposures, hormonal fluctuations, and skincare practices. When this balance is perturbed, it can lead to an overgrowth of acne-causing bacteria, such as *Cutibacterium acnes* (formerly known as *Propionibacterium acnes*), triggering inflammation and contributing to the development of acne lesions. Inadequate skincare practices can create a breeding ground for acne-causing bacteria and exacerbate existing lesions. Infrequent face washing allows sebum, dead skin cells, and bacteria to accumulate on

the skin surface, clogging pores and promoting inflammation. Sebum, an oily substance produced by the sebaceous glands, serves to lubricate and protect the skin. However, excessive sebum production, often triggered by hormonal fluctuations during puberty, can clog pores and create a favorable environment for bacterial growth. Dead skin cells, which are constantly shed from the skin surface, can also contribute to pore clogging if not adequately removed. Bacteria, particularly *C. acnes*, thrive in the oxygen-deprived environment of clogged pores, feeding on sebum and releasing inflammatory byproducts that trigger acne lesions. The use of comedogenic cosmetics, which contain ingredients that can clog pores, can further exacerbate acne lesions. These ingredients, such as heavy oils, waxes, and certain pigments, can create a physical barrier on the skin surface, trapping sebum and dead skin cells within the pores. This can lead to the formation of comedones (blackheads and whiteheads), the earliest lesions in acne vulgaris. Harsh cleansers and aggressive scrubbing can also contribute to acne by disrupting the skin's natural barrier. The skin barrier, composed of lipids, proteins, and antimicrobial peptides, helps maintain skin hydration, regulate pH, and prevent the entry of pathogens. When this barrier is compromised, the skin becomes more susceptible to dryness, irritation, and inflammation, all of which can worsen acne. Proper skincare practices can help maintain skin health, minimize acne breakouts, and improve the overall appearance of the skin. Cleansing the face twice daily with a gentle, non-comedogenic cleanser helps remove excess sebum, dead skin cells, and bacteria from the skin surface, preventing pore clogging and reducing inflammation. It is important to avoid harsh soaps and aggressive scrubbing, which can disrupt the skin's natural barrier and exacerbate acne. Moisturizing the skin regularly with a non-comedogenic moisturizer helps maintain skin hydration and prevent dryness, which can trigger increased sebum production and worsen acne. Moisturizers also help restore the skin's barrier function, protecting it from environmental insults and reducing inflammation. Protecting the skin from sun damage is crucial for maintaining skin health and preventing premature aging. Sun exposure can also worsen acne by triggering inflammation and hyperpigmentation. Using a broad-spectrum sunscreen with an SPF of 30 or higher can help protect the skin from harmful UV rays. Topical acne medications, such as benzoyl peroxide, retinoids, and antibiotics, can be effective in treating existing acne lesions and preventing new ones from forming. These medications work by reducing sebum production, unclogging pores, killing bacteria, and reducing inflammation. It is important to consult a dermatologist to determine the most appropriate topical medications for individual skin needs and to monitor for any potential side effects. Choosing non-comedogenic cosmetics, which do not clog pores, can help prevent acne breakouts. It is important to read product labels carefully and avoid ingredients known to be comedogenic, such as heavy oils, waxes, and certain pigments. In addition to proper skincare, adopting healthy lifestyle habits, such as a balanced diet, regular exercise, stress management, and adequate sleep, can further support skin health and minimize acne breakouts. These habits can help regulate hormonal balance, reduce inflammation, and promote overall well-being, all of which are crucial for maintaining healthy skin.[17,18]

The benefits of proper skincare in acne management have been demonstrated in numerous studies. A study among adolescents found that a comprehensive skincare regimen, including gentle cleansing, moisturizing, and the use of topical medications, led to a significant improvement in acne severity. Another study reported that educating adolescents about proper skincare practices resulted in a reduction in acne lesions and improved quality of life. These findings underscore the importance of incorporating skincare education and counseling into acne management strategies. By empowering adolescents with the knowledge and tools to care for their skin, we can help them take an active role in their skin health and minimize the impact of acne on their lives. While the basic principles of proper skincare remain essential, emerging trends and innovations in skincare offer new possibilities for acne management. Probiotics, live microorganisms that confer health

benefits, and prebiotics, substances that promote the growth of beneficial bacteria, are gaining popularity in skincare. These ingredients can help restore the balance of the skin microbiome, reduce inflammation, and improve skin barrier function, potentially benefiting individuals with acne. Antioxidants, such as vitamin C and E, can neutralize free radicals, unstable molecules that can damage skin cells and contribute to inflammation. Incorporating antioxidants into skincare routines may help protect the skin from oxidative stress and reduce acne severity. Light therapy, which utilizes specific wavelengths of light to target acne-causing bacteria and reduce inflammation, has shown promise in acne treatment. Blue light therapy, in particular, has been shown to be effective in reducing inflammatory acne lesions. With advancements in technology and genetic testing, personalized skincare is becoming increasingly accessible. This approach tailors skincare regimens to individual skin needs and genetic predispositions, potentially optimizing acne treatment outcomes.[19,20]

4. Conclusion

This study has underscored the profound impact of lifestyle factors on acne vulgaris among Bangladeshi adolescents. Our findings highlight a significant association between unhealthy dietary habits, irregular sleep patterns, high-stress levels, inadequate skincare practices, and increased severity of acne. These findings emphasize the necessity of a holistic approach to acne management in this population, encompassing not only topical treatments but also lifestyle modifications. Public health initiatives promoting healthy dietary habits, regular sleep patterns, stress management techniques, and proper skincare practices may significantly mitigate the burden of acne and enhance the quality of life for adolescents in Bangladesh.

5. References

1. Juhl CR, Bergholdt HKM, Miller IM, Jemec GBE, Kanters JK, Ellervik C. Dairy intake and acne vulgaris: a systematic review and meta-analysis of 78,529 children, adolescents, and young adults. Nutrients. 2018; 10(9): 1159.
2. Pappas A, Christodoulou C, Katta R. The relationship between stress and acne: a review of the literature and a proposed model. Int J Dermatol. 2018; 57(11): 1287-95.
3. Khunger N, Kumar C. Stress and Skin. Indian J Dermatol. 2018; 63(4): 276-85.
4. Lee YB, Byun EJ, Kim HS. Potential role of the microbiome in acne: a comprehensive review. J Clin Med. 2019; 8(1): 98.
5. Baldwin H, Tan J, Hardy R. Acne, anxiety, depression and suicide risk in adolescents: a systematic review. Br J Dermatol. 2018; 179(6): 1281-93.
6. Aghasi M, Golzarand M, Shab-Bidar S, Aminianfar A, Omidian M, Taheri R. Dietary behaviors and the risk of acne in adolescents: a case-control study. Dermatology. 2020; 236(1): 38-44.
7. Cengiz FP, Cevirgen Cemil B, Yildiz F, Kacar SD, Can G, Kurt E. Acne vulgaris in adolescents: prevalence, severity, and correlation with nutritional habits and anxiety in Eskisehir, Turkey. Pediatr Dermatol. 2018; 35(6): 738-43.
8. Agak GW, Qin M, Noordin S. Acne vulgaris and its association with dietary habits and lifestyle behaviour among female university students in Selangor, Malaysia. PLoS One. 2019; 14(5): e0217231.
9. Pintore A, Sassu C, Milia MG. Association between acne severity and sleep quality in Italian young adults. Chronobiol Int. 2020; 37(3): 356-66.
10. Patel D, Thiboutot D. The role of diet and exercise in acne. J Drugs Dermatol. 2020; 19(2): 129-31.
11. Fulton JE Jr, Plewig G, Kligman AM. Effect of chocolate on acne vulgaris. JAMA. 1969; 210(12): 2071-74.
12. Penso L, Touvier M, Deschasaux M. Association between adult acne and dietary behaviors: findings from the nutrinet-santé

prospective cohort study. JAMA Dermatol. 2020; 156(7): 718-26.
13. Kolodziejczyk AA, Adamski Z, Rutkowska M, Owczarczyk-Saczonek A. Diet and acne. Postepy Dermatol Alergol. 2019; 36(4): 472-6.
14. Chen M, Tang M, Chen L. The relationship between sleep duration and acne among college students in Taiwan. J Health Psychol. 2021; 26(6): 933-41.
15. Oyetakin OA, Oyetakin MR, Akinkugbe AO. The impact of stress on students in secondary schools in Ibadan, Nigeria. West Afr J Med. 2018; 34(2): 129-34.
16. Graubard BI, Korn EL, Midthune D, Freedman LS. Testing goodness-of-fit in logistic regression without large sample size. Stat Med. 1997; 16(7): 729-44.
17. Kim J, Choi H, Oh JY. Effects of increased smartphone use on mental health and sleep in college students: a prospective cohort study. Sleep Med. 2018; 51: 167-73.
18. Zaenglein AL, Thiboutot DM. Expert committee recommendations for acne management. Pediatrics. 2018; 142(3): e20181741.
19. Zari S, Alrahmani D, Elsayed EM. Impact of psychological stress on acne vulgaris. Clin Cosmet Investig Dermatol. 2018; 11: 313-8.
20. Purnamawati S, Indrastuti N, Danarti R, Sadikin M. The role of oxidative stress in acne vulgaris. J Clin Aesthet Dermatol. 2018; 11(8): 26-30.