www.sasinsights.com E-ISSN: 3107-135X
SCIENCE AND SOCIETY INSIGHTS
Sci Soc Insights (2025), 2: 10-15 Research Article

Examination of the Breakfast Practices among Male Students and their Impact on Health and Scholarly Achievement at UAF

Aman Naz[1], Shoukat Ali[*1] and Ghadah Al Murshidi[2] Muhammad Younas[1]

[1]Institute of Agricultural Extension, Education and Rural Development, University of Agriculture Faisalabad, Pakistan
[2]Curriculum and Instruction Department, College of Education, United Arab Emirates University, UAE
*Corresponding author: shoukat78pk@uaf.edu.pk

Article History: 25-290	Received: 08 Nov 2024	Revised: 08 Feb 2025	Accepted: 08 Feb 2025	Published Online: 2025

Citation: Naz A, Ali S, Murshidi GA and Yonas M, 2025. Examination of the breakfast practices among male students and their impact on health and scholarly achievement at UAF. Sci Soc Insights, 2: 10-15. https://doi.org/10.65822/j.sasi/2025.09

ABSTRACT

Breakfast is considered the most important meal. However, skipping it has become routine among students in universities due to lifestyle changes and irregular routines. Skipping breakfast can lead to negative consequences for students, including impacts on physical and cognitive growth. This study was therefore conducted at the University of Agriculture, Faisalabad, to assess the breakfast habits of male students residing in hostels. The study examines the impact of skipping breakfast on students' health and academic performance. The results reveal that the majority of respondents (79%) have spent more than three years in the hostels. Only 41.2% of students had breakfast regularly. Students who skipped breakfast experienced anxiety, depression, and stress during classes. Students responded that taking breakfast is vital to staying focused in class and being creative. Further, the causes of skipping breakfast were found to be developing a habit of skipping and time pressure to attend morning classes. The study recommends awareness and behavioral campaigns to promote a healthy lifestyle among students.

***Keywords*:** Breakfast habits, University students, Academic performance, Hostel life, Cognitive function, Educational outcomes

INTRODUCTION

Breakfast consumption has long been recognized as a fundamental component of healthy lifestyle practices, yet its specific impact on students' academic performance and daily functioning remains a critical area of educational and public health concern (Kumar & Rizvi, 2024; Adolphus et al., 2019). There is growing evidence that skipping breakfast or fasting negatively impacts children's cognition, motivation, academic achievement, and test scores. Regular breakfast consumption is positively associated with academic achievement in children and adolescents. Hungry children may lack the energy and motivation to participate in classroom activities. At the same time, malnutrition and micronutrient deficiency have been shown to affect physical, mental, and social health and reduce cognitive function (Gao et al., 2021).

The association between breakfast intake and academic achievement is complex because it involves immediate physiological responses, mental ability, and prolonged academic performance. Research indicates that the amount of breakfast consumed dictates the amount of glucose the brain can obtain, which in turn directly affects attention, memory, and the ability to learn. The presence of the positive association between breakfast consumption and academic achievement, comprising grades, test marks, attendance, and behavior, has been identified in prior research (Asadullah et al., 2024; Rampersaud et al., 2019).

The habitual skipping of breakfast has two levels of interrelation: physiological health and cognitive-academic excellence. Lack of Breakfast has been associated with ineffective metabolism, disturbed body glucose levels, leading to insulin resistance and Type 2 diabetes in the long term. It is also linked with dyslipidemia, including elevated levels of LDL cholesterol. In addition, the breakfast skipping habit has a propensity to overeating later in the day, which leads to overall higher dietary caloric consumption, leading to weight gain and obesity, a paradoxical result of skipping breakfast to lose weight (Akhlaq et al., 2025; Kral et al., 2020; Kim et al., 2023). Further, a nutritionally poor breakfast can lead to feelings of low energy, boredom, and loss of concentration, which can

complicate the process of being physically active (Ashfaq et al., 2023). The sum of all these processes raises serious questions about the impact of breakfast habits, both in the short- and long-term, on cognitive functioning and overall academic performance of students.

Despite extensive studies on the nutritive value of breakfast, there is still a need for a comprehensive understanding of how students perceive and experience the effects of breakfast consumption on their daily lives, especially day-to-day academic activities. Even though objective measures of cognitive function can be quite informative, students' subjective experiences regarding the impact of breakfast can be of utmost value in developing specific interventions and education policies. Interestingly, literature has widely reported the correlation between academic performance and breakfast intake. It has also been found that regular breakfast intake is associated with higher attendance, greater active involvement in classroom discussions, and better educational outcomes among students (Birch and Ventura, 2020). Therefore, it is vital to explore students' perceptions of the importance of breakfast and how they feel when they skip it (Ayoub et al., 2024; Reuter et al., 2021).

Although the importance of breakfast is well recognized, there is a literature gap in the field regarding its effect on academic outcomes in Pakistani universities. Previous studies have focused on school-age children, while studies on the perception and impact of breakfast intake among male students in higher education institutions are limited. Therefore, the current research examined the causes of skipping breakfast and the impact of breakfast consumption and skipping on physical state and learning outcomes, as perceived by students themselves. By considering the negative implications of missing breakfast and the benefits of having breakfast regularly, this paper seeks to provide in-depth insight into the impact of this nutritional practice on students' academic lives.

MATERIALS AND METHODS

The present study was conducted to assess the breakfast habits and exam performance of male respondents currently living at the University of Agriculture, Faisalabad. A list of all boarder respondents was collected from the Hall Warden's office. The study population comprised 3014 respondents (students residing in different hostels of the university). From the population, 119 respondents were selected for data collection using a simple random sampling technique.

Keeping the research objectives in mind, a well-structured questionnaire was developed for the respondents. During the development of the questionnaire, it was consulted with various Professors at the Institute of Agricultural Extension, Education and Rural Development at the university and their suggestions/comments were incorporated. The questionnaire was developed in English and then translated into Urdu for the convenience of respondents and ease of data collection. It was pre-tested on 14 respondents residing at Hashmi Hall and Faisal Hall, who were not included in the actual sample, to measure Cronbach's Alpha, which was found to be 0.83 using SPSS. Considering the suitability of the Likert scale for assessing respondents' attitudes and perceptions, most questions were bipolar, and two five-point Likert scales were also used, i.e., 1. Never 2. Rarely 3. Sometimes 4. Often 5. Always and also 1. Strongly agree 2. Agree 3. Undecided 4. Disagree 5. Strongly disagree.

Descriptive statistics such as means, standard deviations, frequencies, ranks, etc. were computed using the Statistical Package for the Social Sciences (SPSS) to analyze the data.

RESULTS AND DISCUSSION

Table 1 indicated that the majority of respondents (53.8%) fell within the age range of 24-26 years, while 30.3% were categorized as up to 23 years, and only 16% of respondents were in the 27-35 years category. A significant 81.5% of the participants identified as undergraduates. Conversely, 13 respondents, representing approximately 10.9%, held post-graduate degrees, while merely 7.6% of the respondents were pursuing PhD qualifications. Table 1 also presents the duration of time that the respondents have spent in hostel living. Approximately 56.3% of the participants reported having resided in the hostel for over three years, while the remainder indicated an experience of one to three years in the hostel environment. Table 1 also indicates that 79% of the respondents rely directly on their parents or guardians for their pocket money and expenses. Among the respondents, 10.1% are engaged in private or home tutoring roles. Approximately 11% rely directly on their scholarships or possess alternative income sources. Table 1 indicated that 84.9% of respondents are middle-class. While 10.9% came from wealthy households. Only 4.2% of responders come from lower-class backgrounds. The table presented demonstrates that a significant portion of respondents, specifically 41.2%, engage in the practice of having breakfast on a daily basis. Approximately 48.1% consume breakfast based on their mood and the time available.

Approximately 41% of students tend to skip breakfast, a figure significantly higher than the 26.3% reported in a study conducted by Zulfiqar et al. (2024). in Pakistan. This finding highlights a significant prevalence of irregular breakfast consumption among students. Comparable studies in Pakistan and internationally have emphasized that Breakfast skipping is a common phenomenon among university students, influenced by late-night study, hostel living, financial issues, and lack of awareness (Adolphus et al., 2019; Watson et al., 2021). Skipping breakfast has been linked to poor academic performance, lower concentration, and adverse health outcomes.

Table 1: Distribution of respondents based on their demographic-characteristics

Age	Frequency	Percent
Up to 23	36	30.3
24 to 26	64	53.8
27 to 35	19	16.0
Education level		
Graduation	13	10.9
Post-Graduation	97	81.5
PhD	9	7.6
Hostel life (in years)		
up to 1y	27	22.7
1-3y	25	21.0
Above 3y	67	56.3
Source of pocket money		
Guardian	94	79.0
Tuition	12	10.1
Scholarship	4	3.4
Another	9	7.5
Living Standard		
High	13	10.9
Middle	101	84.9
Low	5	4.2
Breakfast Habit		
Never	13	10.9
Daily	49	41.2
2/3 times in week	25	21.0
3/4 times in week	10	8.4
Sometimes	22	18.5
Total	119	100.0

Table 2 presents the effects of skipping breakfast on students' physical and mental well-being, ranked by weighted scores (WS) and mean values. The analysis reveals that concentration difficulties emerged as the most prominent consequence of Breakfast skipping, with a mean score of 3.14 (SD = 1.39, WS = 374, Rank 1st). This finding indicates that students consistently experience significant challenges in maintaining focus during academic activities when they skip breakfast. Hunger sensations ranked second (Mean = 2.91, SD = 1.30, WS = 346), followed closely by hunger-induced headaches (Mean = 2.88, SD = 1.28, WS = 343). These physiological responses demonstrate the direct impact of breakfast omission on students' immediate physical comfort and cognitive capacity. The high mean scores for these top three effects suggest that the majority of respondents experience these symptoms regularly when skipping breakfast. Psychological effects were also notable, with anxiety and anxiousness ranking fourth (Mean = 2.49, SD = 1.27, WS = 296). This finding aligns with previous research indicating that nutritional status significantly influences mental health and emotional regulation among students (Mardiyah et al., 2024; Said et al., 2025). The presence of fatigue (Mean = 2.33, Rank 5th) and stress (Mean = 2.26, Rank 6th) further emphasize the comprehensive impact of breakfast skipping on students' overall well-being. Less frequent but still significant effects included drowsiness (Mean = 2.08, Rank 7th) and dizziness (Mean = 1.94, Rank 8th). The relatively lower means for these symptoms suggest they occur less consistently across the student population, though they remain concerning health indicators.

These findings reinforce the critical role of breakfast in maintaining both health and academic performance among male students at UAF. The results revealed that skipping breakfast significantly affects concentration, hunger levels, and cognitive stability, while breakfast consumption promotes active participation, focus, and interaction in class. These findings are consistent with previous studies which emphasized that breakfast omission impairs memory, attention, and learning capacity (Micha et al., 2021; Ashfaq et al., 2023). Moreover, the psychological consequences such as anxiety, stress, and fatigue observed in this study parallel the results of Akhlaq et al. (2025) and Abro et al. (2021), who associated irregular breakfast habits with increased emotional distress.

Effects of Taking Breakfast on Educational Performance

The analysis of breakfast consumption's positive effects on education reveals a different pattern of impacts compared to the negative effects of skipping breakfast. The highest-ranked benefit was staying active in contact with teachers (Mean = 2.53, SD = 1.20, WS = 301), indicating that well-nourished students demonstrate better engagement with instructors and participate more actively in classroom interactions.

Staying mentally active ranked second (Mean = 2.50, SD = 1.15, WS = 297), closely followed by increased classroom questioning behavior (Mean = 2.50, SD = 1.23, WS = 297, tied for 3rd). Enhanced class focus ranked fourth with a nearly identical score (Mean = 2.48, SD = 1.23, WS = 295). These top-ranking effects demonstrate that breakfast consumption primarily influences students' cognitive engagement and interactive learning behaviors.

Notably, the means for positive breakfast effects (ranging from 1.89 to 2.53) were generally lower than the means for negative skipping effects (ranging from 1.94 to 3.14). This disparity suggests that students may be more acutely aware of the adverse consequences of skipping breakfast than of the specific benefits of eating breakfast, or that the negative effects are more immediately noticeable. Academic performance indicators showed mixed results. While quiz performance improvement ranked 7th (Mean = 2.13, WS = 253), other academic behaviors, such as assignment submission timeliness ranked much lower (Mean = 1.89, Rank 13th). This pattern indicates that breakfast consumption may have stronger immediate effects on classroom engagement than on long-term academic task completion.

Table 2: Distribution of respondents based on their habits of skipping and taking breakfast

Effect of skipping breakfast on their body	Mean	SD	WS	Rank
You can't focus so much on reading	3.1429	1.39178	374	1st
Feel hungry	2.9076	1.30183	346	2nd
Headaches due to hunger	2.8824	1.28338	343	3rd
Feel anxiety and anxious	2.4874	1.27469	296	4th
Feel tired	2.3277	1.50203	277	5th
Feel stress	2.2605	1.41099	269	6th
You feel drowsy	2.084	1.23219	248	7th
You start to feel dizzy	1.9412	1.18818	231	8th
Effect of taking breakfast on their education				
Stay active in contact with your teachers	2.5294	1.19904	301	1st
You stay mentally active	2.4958	1.14887	297	2nd
You ask questions in class	2.4958	1.23422	297	3rd
Focus in your class increases	2.479	1.22716	295	4th
You get good marks in the quiz	2.1261	1.05409	253	7th
You work happily with friends	2.1261	1.10127	253	8th
Your attendance is good	2.0588	1.11457	245	9th
You have to be easy to understand	1.9832	0.98276	236	11th
You spend most of the day reading	1.8992	0.94236	226	12th
You submit the assignment on time	1.8908	1.02337	225	13th

On the other hand, the positive outcomes of regular breakfast intake on classroom work and psychological well-being are quite similar to those reported by AlFaris et al. (2022), who emphasized breakfast as one of the most important food habits for improving academic performance. The relatively lower-ranked benefits, such as good attendance, prompt assignment delivery, and improved social interaction, however, still resonate with the studies by AlTamimi et al. (2022) and Ricotti et al. (2021), who reported more general academic and behavioral advantages of eating breakfast. Overall, these pieces of evidence suggest that breakfast is not just a nutritional necessity but also an academic facilitator, which is directly related to positive learning environments and student performance.

Table 3: Distribution of respondents according to reasons why they skip their breakfast.

Statement	Mean	St. Deviation	Weighted Score	Rank
Not a habit	4.003	0.36784	476	1
I don't like to eat early morning	3.8319	0.37551	456	2
There is no time	3.8731	0.42059	361	3
Unknown Reasons	3.7683	0.48198	448	4
There is no hunger	3.7647	0.42598	418	5
Nothing available with fine quality and taste	3.4445	0.48198	319	6
Do not have money for Breakfast	3.2143	0.45366	383	7
To lose weight	2.8803	0.48478	243	8
The stomach does not digest	2.6303	0.48478	313	9
Smoke instead of Breakfast	1.5798	0.49567	188	10

According to Table 3, the most respondents agreed that skipping breakfast has become a habit, as the statement ranked first with the highest mean value (M = 4.003), indicating a behavioral tendency and lifestyle choices among students to see skipping breakfast as a habit rather than any external limitations. The second-ranked reason for not taking breakfast was the statement "I don't like to take a meal early in the day," with a mean value of 3.8319. This is followed closely by students' agreement on the statement that there is no time for Breakfast (M = 3.873). The reason may be that students sleep late at night and wake late in the morning, which gives them little time to be ready for morning classes; hence, they skip breakfast. Most classes started early in the morning, and respondents had to reach and attend those classes at those times. For instance, a previous study mentioned that "the main reasons for missing breakfast are lack of time and the gradual disappearance of the breakfast habit. Too much hurry in the morning is associated with a less healthy and less frequent breakfast" (Córdoba Caro et al., 2014).

These results are very consistent with the prior studies by Timlin & Pereira (2007) and Adolphus et al. (2019), according to whom students and young working individuals tend to skip breakfast because of morning time pressures and workload pressure. There is also a moderately high response: students agreed that they feel no hunger in the morning. A study by Scheer (2013) found that circadian rhythm, or the body's natural clock, diminishes morning appetite and feelings of hunger, helping individuals fast for longer.

On the other hand, the comparatively lower mean against statements about the unavailability of quality and tasty breakfast, and about skipping breakfast to lose weight, indicate that students are neutral on this matter. The same is true of the statement about financial issues forcing them to skip breakfast, which is ranked seventh on the list. This suggests that some students are facing socio-economic pressure that affects their nutritional intake. While the statement that students skip breakfast because of stomach issues and the habit of smoking in the way of taking breakfast attained the lowest mean values (2.6303, 1.5798), suggesting that students disagree with these factors.

Conclusion

The results reveal that the majority of respondents (79%) spent more than three years in the hostel and were dependent on guardians for study expenses and pocket money. 10.1% respondents met their expenses by earning from tuitions. The majority of respondents were undergraduates (81.5%), while 10.9% were postgraduates and 7.6% post-graduation and PhD levels, respectively. Only 41.2% of students had breakfast regularly. The findings of the study show that breakfast habits have a clear and significant impact on various spheres of student life, both physically and academically. Students who skipped breakfast experienced anxiety, depression, and stress during classes. Students responded that taking breakfast is vital to staying focused in class and being creative. Further, the causes of skipping breakfast were found to be developing a habit of skipping and time pressure to attend morning classes. Such outcomes can be instructive for policies promoting healthy lifestyles among university studentsresiding in hostels. Additionally, future studies research focus on longitudinal studies examining how consistent breakfast consumption influences sustained educational engagement and performance outcomes.

Declarations

Funding

This study didn't receive any funding from any public, commercial, or non-profit agencies.

Conflicts of Interest

Authors have no conflicts of interest.

Data Availability

Data will be available from the corresponding author upon request.

Ethics Statement

The Institute of Agricultural Extension, Education, and Rural Development at the University of Agriculture, Faisalabad, approved the study involving human participants. The studies were conducted in accordance with local laws and institutional norms. The participants provided written informed consent to participate in this study.

Authors' Contribution

Aman Naz; Conceptualization, Data Curation, Methodology, Data Original draft, Data Collection, Shoukat Ali; Supervision, Writing, Review and Editing, Ghadah Al Murshidi; Writing, Review and Editing, Muhammad Younas; Writing, Review and Editing

Generative AI Statements

The authors confirm that no generative artificial intelligence-based tools were employed for content generation or interpretation. All intellectual content, interpretations, and conclusions are the sole responsibility of the authors.

Publisher's Note

All opinions, analyses, and conclusions presented in this publication are those of the authors alone. They do not necessarily correspond to the positions of the publisher, editorial team, reviewers, or affiliated institutions. The publisher neither certifies nor endorses any products, procedures, or claims discussed and accepts no liability arising from their use.

REFERENCES

Abro, S., Saleem, Q., Lashari, J., Khalid, G., Khan, M., & Malik, F. (2021). Breakfast practices and factors associated with skipping breakfast in medical students. Journal of Rawalpindi Medical College, *25,* 37–41.

Adolphus, K., Lawton, C.L. & Dye, L. (2019). Associations Between Habitual School-Day Breakfast Consumption Frequency and Academic Performance in British Adolescents. Front. Public Health, 7:283. doi: 10.3389/fpubh.2019.00283

Akhlaq, M., Shah, S. M. K. A., Akram, M., Alum, M. K., Ali, S. R., & Khan, H. T. (2025). Integrative role of herbal bioactives and dietary modulation of gut microbiota in the prevention of gastrointestinal cancers. Kashf Journal of Multidisciplinary Research, 2(8).

AlFaris, N. A., Alshwaiyat, N. M., Alkhalidy, H., Alagal, R. I., AlTamimi, J. Z., & AlKehayez, N. M. (2022). Breakfast skipping in a multi-ethnic population of middle-aged men and relationship with sociodemographic variables and weight status. *Frontiers in Nutrition, 8,* 761383. https://doi.org/10.3389/fnut.2021.761383

AlTamimi, J. Z., Alshwaiyat, N. M., Alkhalidy, H., AlFaris, N. A., AlKehayez, N. M., & Alagal, R. I. (2022). Breakfast skipping among a multi-ethnic population of young men and relationship with sociodemographic determinants and weight status. International Journal of Environmental Research and Public Health*, 19*(5), 2903. https://doi.org/10.3390/ijerph19052903

Asadullah, M., Hashim, S., Anwar, A., Rehman, M. A., Saleem, N., & Muneeb, A. (2024). The impact of breakfast omission on daily activities and academic achievement: A cross-sectional study at Fazaia Ruth Pfau Medical College. *Recent Progress in Nutrition, 4*(3). https://doi.org/10.21926/rpn.2403016

Ashfaq, M. M., Jawed, N., Safdar, N. F., et al. (2023). Breakfast patterns in relation to physical activity among school adolescents in Karachi, Pakistan. Journal of Health, Population and Nutrition*, 42,* 116. https://doi.org/10.1186/s41043-023-00463-6

Ayoub, S., Kaur, G., Sharma, V., & Shazia. (2024). Effect of skipping breakfast on different domains of cognitive function among undergraduate medical students: A cross-sectional study. Journal of Population Therapeutics & Clinical Pharmacology, *31*(6), 1457–1463. https://doi.org/10.53555/jptcp.v31i6.4321

Birch, L. L., & Ventura, A. K. (2020). Influences on the development of children's eating behaviors: From infancy to adolescence. Canadian Journal of Dietetic Practice and Research*, 81*(3), 125–134. https://doi.org/10.3148/cjdpr-2019-048

Gao, C. L., Zhao, N., & Shu, P. (2021). Breakfast consumption and academic achievement among Chinese adolescents: A moderated mediation model. Frontiers in Psychology, 12, 700989. https://doi.org/10.3389/fpsyg.2021.700989

Kim, Y., An, H., & Seo, Y. (2023). The relationship between breakfast and sleep and cardiovascular risk factors. *Nutrients, 15*(20), 4596. https://doi.org/10.3390/nu15204596

Kral, T. V. E., Whiteford, L. M., & Heo, M. (2020). Effects of skipping breakfast on cognitive performance and mood. Appetite, 144, 104486. https://doi.org/10.1016/j.appet.2019.104486

Mardiyah, S., Wandini, K., & Dwiyana, P. (2024). The relationship between stress, emotional eating, and nutritional status in adolescents. Jurnal Gizi dan Dietetik Indonesia (Indonesian Journal of Nutrition and Dietetics), 12(4), 252-261.

Mathiyalagen, P., Yadav, D., Anandaraj, R., Vasudevan, K., Sundar, B., & Priyadharsini, R., et al. (2019). Breakfast consumption habit and its impact on nutrient intake and nutritional status of medical undergraduates. *Progress in Nutrition, 21*(3), 570–576. https://doi.org/10.23751/pn.v21i3.8600

Micha, R., Peñalvo, J. L., Cudhea, F., Imamura, F., Rehm, C. D., & Mozaffarian, D. (2021). Association between school nutrition policies and dietary behaviors: A systematic review. *American Journal of Public Health, 111*(1), 45–54. https://doi.org/10.2105/AJPH.2020.305933

Pengpid, S., & Peltzer, K. (2020). Skipping breakfast and its association with health risk behaviour and mental health among university students in 28 countries. Diabetes, Metabolic Syndrome and Obesity, 13, *2889–2897.* https://doi.org/10.2147 /DMSO.S267904

Reuter, P. R., Forster, B. L., & Brister, S. R. (2021). The influence of eating habits on the academic performance of university students. Journal of American College Health, 69(8), 921–927. https://doi.org/10.1080/07448481.2020.1715986

Ricotti, R., Caputo, M., Monzani, A., Pigni, S., Antoniotti, V., Bellone, S., et al. (2021). Breakfast skipping, weight, cardio-metabolic risk, and nutrition quality in children and adolescents: A systematic review of randomized controlled and intervention longitudinal trials. Nutrients, *13*(10), 3331. https://doi.org/10.3390/nu13103331

Said, N. B., Ismah, Z., & Aisyah, S. (2025). The Relationship Between Stress And Nutritional Status Of Students In Indonesia: A Cross-Sectional Study. Journal of Community Mental Health and Public Policy, 7(2), 87-93.

Scheer, F. A., Morris, C. J., & Shea, S. A. (2013). The internal circadian clock increases hunger and appetite in the evening independent of food intake and other behaviors. *Obesity*, *21*(3), 421-423.

Watson, E. J., Khor, S., & McKenzie, M. (2021). Food preferences and breakfast behaviors among adolescents. *Appetite, 156,* 104912. https://doi.org/10.1016/j.appet.2020.104912

Zulfiqar, A.-A., Habchi, P., & Dembele, I. A. (2024). RETRACTED: Zulfiqar et al. Obesity and Frailty Syndrome in the Elderly: Prospective Study in Primary Care. *Medicines* 2022, *9*, 38. *Medicines*, *11*(8), 22. https://doi.org/10.3390/medicines11080022