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Original Research Article

Measurement of Serum Immunoglobulin Levels (IgG, IgM and IgA) among Dormitory Students in College of Health and Medical Technologies-Basra, Southern Technical University-Iraq

Saja Majid Hamid[1]*

[1]Department of Medical Laboratory Technology, College of Health and Medical Technology, Southern Technical University, Basra, Iraq

***Corresponding Author:** Saja Majid Hamid
Department of Medical Laboratory Technology, College of Health and Medical Technology, Southern Technical University, Basra, Iraq

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Abstract: ***Background*:** It has been proven that residential environment and biological sex affect immunity, but there is limited evidence of the combined effect of both factors on immunoglobulins in serum of university students. ***Objectives*:** To examine (IgG, IgA, and IgM) concentrations in serum of undergraduate students depending on residential status, gender, and years of dormitory living. ***Methods*:** The cross-sectional study included 60 undergraduate students who were further stratified by gender (30 males, 30 females) from the Southern Technical University, College of Health and Medical Technologies. There were 40 dormitory students and 20 non-dormitory students enrolled in the study. Serum immunoglobulins concentration was measured through automated Abbott Architect Ci4100 analyzer. ***Results*:** Significantly ($p \leq 0.05$) increased levels of serum IgG were noted in dormitory residents (1273.37±218.77) mg/dL compared to non-dormitory residents (963.07±262.32) mg/dL according to gender among dormitory residents. The present data showed that female students had significantly higher ($p \leq 0.05$) levels of IgM (152.22±67.954) mg/dL compared to male 94.25±44.22 mg/dL, while IgA levels in male showed a significant elevation ($p \leq 0.05$) in male (242.75±84.92) mg/dL compared to female (192.37±49.697) mg/dL. Regarding to the duration of residence of students less than 2 years group showed higher concentrations of IgM (172.52±61.87) mg/dL compared to more than 2 years group (137.56±58.825) mg/dL. While IgG exhibited a significant increase in more than 2 years group (1304.36±199.09) mg/dL compared to less than 2 years group (1172.76±233.73) mg/dL. ***Conclusion*:** The present study demonstrated that dormitory residence was associated with altered humoral immune responses among university students particularly through elevated serum IgG concentrations compared with non-dormitory.

Keywords: Adaptive Immunity, Dormitory, IgG, IgM, IgA.

INTRODUCTION

Transitioning to college constitutes a major developmental period during which many changes occur, not only psychologically but also environmentally and physiologically. Yet for many other students, transitioning to college also translates to living on campus. Although living in dormitories is associated with increased sociability and academic performance, it also entails a set of challenges that could affect physiological balance, especially the immune system [1]. Academic pressures, sleep architecture changes, poor nutrition, and overcrowding contribute to the development of an atmosphere that may be stressful to the functioning of the body's immune system. This explains why college students who live in dorms tend to have higher incidences of upper respiratory infections, gastroenteritis, and longer recovery times than those not living in dorms [2].

Clinical immunology and internal medicine rely on the quantification of immunoglobulins in the blood to evaluate the efficacy of the humoral immune response. IgG, IgM, and IgA levels are the primary indicators used for this purpose

[3]. The living situation in dormitories represents an ecosystem in which various behavioral and environmental factors come into play to influence immune responses. University students experience chronic stress due to many reasons, such as academic workload, examination pressures, financial worries, and adaptation to a new social context. Psychoneuroimmunology is an emerging discipline that has described many aspects of bidirectional signaling between the brain and the immune system, particularly involving the HPA axis and sympathetic nervous system [4]. Chronic psychological stress results in prolonged activation of corticosteroid and catecholamine secretion with immunosuppressive actions on the immune response.

Life in dormitories is notoriously linked to irregular sleep patterns, insufficient sleep, and low-quality sleep. Environmental factors such as communal living arrangements, environmental noise, night studies, and socialization events often interfere with the natural circadian cycle [5]. The sleep-wake process and immune response have a well-conserved reciprocal regulation system [6]. Healthy sleep pattern plays an indispensable role in maintaining the equilibrium of the immune system and allowing the formation of immune memory and efficient performance of innate and adaptive immune cells [7]. The diet of students is mainly comprised of foods available in the canteens, vending machines, and cheap and very processed fast foods, hence making it energy rich but nutrient poor. Nutrition is vital in ensuring that the immune system remains healthy, since immune cells require energy and nutrients to divide and produce antibodies [8]. This study aims to examine (IgG, IgA, and IgM) concentrations in serum of undergraduate students from the Southern Technical University, College of Health and Medical Technologies depending on residential status, gender, and years of dormitory living.

METHODOLOGY

Study Population

The study involved 60 undergraduate students. The subjects were categorized into two different groups depending on their residency status; dormitory residents were 40 students who lived on campus in the university's residential houses, while non-dormitory residents were 20 students who lived off-campus in either personal or family residences. The experiment took place at College of Health and Medical Technologies, Southern Technical University, Iraq, during the period of October 2025 to February 2026. The dormitory group (n=40) was classified into two groups depending on their duration of residence; Group A (less than 2 years) consisted of 20 students, while Group B (more than 2 years) consisted of 20 students.

Inclusion Criteria

The participants could enroll in the study provided they fulfilled the following criteria: they were full-time students aged (18-25) years they had resided continuously in their designated residential area (dormitory or non-dormitory) for at least six months before enrollment; they were healthy with no history of acute systemic disease.

Exclusion Criteria

Exclusion criteria included having any one of the following conditions: primary immunodeficiency or autoimmune disorders; chronic infections such as HIV, hepatitis B/C; active malignancy or undergoing cancer treatment in the last two years; use of any immunosuppressants (such as corticosteroids in amounts >10 mg daily, DMARD, biologicals); systemic antibiotics usage in the previous two weeks before sample acquisition; live vaccine administration in the last 28 days and inactivated vaccines in the last 14 days; acute infection, fever, or illness in the past 14 days; chronic kidney disease, liver disease, and active TB; smoking, pregnancy or breastfeeding; sleep deprivation (<6 hours per night) or any sleep disorders; recent international travel within 30 days.

Samples Collection

Samples of blood were withdrawn by venipuncture from (60) participants. Five ml of blood sample was aspirated using a sterile syringe. The blood sample was then transferred into a sterile plain tube, where the clotting process occurred. This procedure was followed by centrifuging the sample at 4000 rpm for 15 minutes to obtain the serum which was subsequently frozen at -20 ºC before measuring the concentration of IgG, IgA, and IgM.

Measurement of the Concentrations of Immunoglobulins (IgG, IgA, and IgM)

Serum immunoglobulin IgG, IgA, and IgM kits provided from (Abbott laboratories, USA) measured by automated Abbott Architect Ci4100 analyzer.

Statistical Analysis

The normality of data was checked through Shapiro-Wilk test. A significant probability (*p*) value was considered as 0.05 or less. It was conducted in a statistical program, IBM SPSS version 25.0. The quantitative variables were evaluated in the form of (mean + Standard Deviation). A Comparisons between two independent groups were performed using the independent sample T-test for normally distributed variables.

RESULTS

(Table 1) displayed the study participants' demographic information. There was no significant difference in the mean age between those who lived in dorms (21.49±0.50 years) and those who did not (21.33±0.84 years) (p=0.47). Similarly, there was no discernible variation in the distribution of genders between the two groups because the proportion of males and females in both dormitory and non-dormitory residents was equal (50% each) (χ^2= 0.001, p=1.00).

As for the amount of sleep, the mean sleep time was significantly shorter among residents who lived in dorms (6.03±1.25 hours) than among those who did not live in dorms (6.67±0.84 hours) (p=0.02). Further, there were significant between-group differences in the eating behavior of breakfast. The dormitory residents admittedly skipped breakfast more often than the non-dormitory residents (62.5% vs. 30%, respectively; χ^2= 5.5, p=0.01); however, non-dormitory residents were more likely to eat breakfast than dormitory residents (70% vs. 37.5%, respectively).

Table 1: Demographic distribution of the study

Demographic	**Dormitory residents (N=40)**	**Non-dormitory residents (N=20)**	***p-value***
Age Mean ± SD	21.49± 0.50	21.33± 0.84	0.47
Gender n (%)			χ^2 =0.001, p= 1.00
Male	20(50%)	10 (50%)	
Female	20(50%)	10 (50%)	
Sleep duration / hours (Mean ± SD)	6.03± 1.25	6.67± 0.84	0.02*
Breakfast consumption			
Consume breakfast	15 (37.5%)	14 (70%)	χ^2 =5.5, p=0.01*
Skip breakfast	25(62.5%)	6 (30%)	

χ^2=chi-square, *$p\leq$0.05= considered statistically significant, n= number of samples, SD=standard deviation

Table 2 exhibited markedly a significant ($p\leq$0.05) elevation in the concentrations of IgG among Dormitory residents (1273.37± 218.77) mg/dL compared to Non-dormitory residents (963.07 ± 262.32) mg/dL while IgM and IgA didn't show any significant difference.

Table 2: The concentrations of (IgM, IgA and IgG) mg/dL between Dormitory residents and Non-dormitory residents

Parameters	**Groups**	**N**	**Mean ± SD**	***p-value***
IgM mg/dL	Dormitory residents	40	138.97± 67.409	0.584
	Non-dormitory residents	20	127.53 ± 66.799	
IgA mg/dL	Dormitory residents	40	203.89± 61.92	0.627
	Non-dormitory residents	20	193.73± 78.95	
IgG mg/dL	Dormitory resident	40	1273.37± 218.77	0.001*
	Non-dormitory resident	20	963.07 ± 262.32	

*$p\leq$0.05= considered statistically significant, n= number of samples, mg/dL= milligram per deciliter, SD= standard deviation

According to gender among dormitory residents, the present data showed that female students had significantly higher ($p\leq$0.05) levels of IgM (152.22±67.954) mg/dL compared to male (94.25±44.22) mg/dL, while IgA levels in male showed a significant elevation ($p\leq$0.05) in male (242.75±84.92) mg/dL compared to female (192.37±49.697) mg/dL as shown in (Table 3).

Table 3: The concentrations of (IgM, IgA and IgG) mg/dL among Dormitory residents group according to gender

Parameters	**Gender**	**N**	**Mean ± SD**	***p*–value**
IgM (mg/dL)	Female	20	152.22±67.954	0.030*
	Male	20	94.25±44.22	
IgA (mg/dL)	Female	20	192.37±49.697	0.041*
	Male	20	242.75±84.92	
IgG (mg/dL)	Female	20	1276.81±225.04	0.867
	Male	20	1261.75±210.143	

*$p\leq$0.05= considered statistically significant, n= number of samples, mg/dL= milligram per deciliter, SD= standard deviation

Regarding to the duration of residence of students less than 2 years group showed higher concentrations of IgM (172.52±61.87) mg/dL compared to more than 2 years group (137.56±58.825) mg/dL, while IgG exhibited a significant increase in more than 2 years group (1304.36±199.09) mg/dL compared to Less than 2 years group (1172.76±233.73) mg/dL as in (Table 4).

Table 4: The concentrations of (IgM, IgA and IgG) mg/dL among Dormitory residents group according to duration of residence

Parameters	Duration of residence	N	Mean ± SD	*p*-value
IgM (mg/dL)	Less than 2 years	20	172.52±61.87	0.046*
	More than 2 years	20	137.56±58.825	
IgA (mg/dL)	Less than 2 years	20	189.20±60.79	0.346
	More than 2 years	20	204.40±56.317	
IgG (mg/dL)	Less than 2 years	20	1172.76±233.73	0.037*
	More than 2 years	20	1304.36±199.09	

*$p \leq 0.05$= considered statistically significant, n= number of samples, mg/dL = milligram per deciliter, SD= standard deviation

DISCUSSION

The age distributions among the study groups were comparable, and age is a critical factor that directly affects humoral immune responses and antibody production capacity [9]. The gender distribution was also equivalent, allowing for a meaningful comparison of sex-specific immunological differences, between both groups. Recent studies have shown that females consistently have stronger antibody responses compared to age-matched males, with women having elevated levels of immunoglobulin against multiple antigens [10, 11]. Two important life-style differences did show up between the groups and should be interpreted with caution. The mean hours of sleep in dormitory residents was significantly ($p \leq 0.05$) lower than that of non-dormitory residents. Further, the breakfast habits were found to be significantly different among the groups, with only 37.5% of the residents living in the dormitory eating breakfast regularly, while 70% of the non-dormitory residents were eating breakfast regularly (p-value=0.01). This nutritional difference is clinically meaningful because recent studies have shown that eating breakfast is linked to improved immune cell function and humoral responses among university-aged individuals [12].

The present result of this study was the significantly higher level of serum IgG found among students residing in dormitories as compared with those who do not reside in dormitories ($p \leq 0.05$). Such a result agreed well with existing knowledge regarding the fact that serum IgG is the dominant immunoglobulin type in humoral immunity and acts as an indicator of adaptive immunity [13]. The increased level of serum IgG among students residing in dormitories can be associated with increased exposure to various antigens. The dormitory lifestyle is associated with dense populations, frequent interactions between people, and common-use facilities that altogether make for an environment conducive to the spread of infectious agents [14]. Living in such an environment where people live in close quarters, use common bathrooms, eating areas, and other common facilities makes it easier for infectious agents affecting the respiratory tract and the gastrointestinal tract, among others, to spread. The result is that residents in dormitories are exposed to a greater number of different kinds of pathogens compared to those living outside dormitories [15]. The elevated level of IgG observed among students staying in dorms may be considered as an indication of the increased adaptive immunity activation resulting from the increased antigen exposure. IgG antibodies, mainly synthesized by long-lasting plasma cells and memory B-cells, build up over time due to the repeated or continuous exposure to antigens [16]. Therefore, the elevated IgG level among students staying in dorms indicates that these students mount more effective adaptive immune responses against the various pathogens that challenge them due to sharing of the common living space. This conclusion is also based on the results of analysis of the duration of stay in the dorms, where shorter stay in dorms (less than 2 years) was associated with an even higher level of IgG compared to a longer stay.

The marked rise in the concentrations of IgM in female subjects relative to male subjects (31% increase in both cases, $p \leq 0.05$) is a noteworthy result, with considerable physiological and immunological significance. Such differences in levels of immunoglobulin generation between genders are in accordance with past scientific work indicating higher humoral immunity in females than in males [17, 18]. IgA is an essential component of the immune system responsible for ensuring the barrier integrity and preventing pathogens from crossing through epithelial cells. The higher amount of IgA in male could indicate the stronger ability of their mucosal immunity systems to detect pathogens and respond effectively. The presence of higher levels of IgM in women indicates highly reactive B-cells that can initiate a fast primary immune response. This is consistent with findings in immunology research that have consistently shown that women exhibit more effective immune responses involving both T-cells and B-cells than men [19] .The main sex hormone in females, estrogen, has been found to have immunostimulatory properties for both innate and adaptive immune responses 18 estrogen signaling stimulates B-cell proliferation, increases antibody secretion, and promotes T-cell stimulation. On the other hand, the main

male sex hormone, testosterone, has been found to have immunosuppressive properties, inhibiting antibody secretion and T-cell mediated immunity [18].

The current results showed that the IgM levels were significantly higher ($p \leq 0.05$) and the IgG concentrations were lower in students residing in dorms for less than two years compared to students living there for more than two years which may be explained by antigen exposure dynamics and adaptive immune maturation. Immunoglobulin G (IgG) is a more advanced, memory-based, class-switched immunity, while Immunoglobulin M (IgM) is usually the first antibody produced in primary immunological responses [20]. Thus, the pattern observed would suggest that students at the start of living in a dorm are being exposed to new environmental antigens either recently or continuously. Higher microbial diversity, shared utilities, and increased interpersonal contact are all characteristics of dorm environments that might increase exposure to environmental antigens and infectious pathogens. Acute humoral reactions dominated by IgM production may be triggered by early exposure to such settings. On the other hand, immunological adaptation, such as class switching from IgM to IgG and the formation of immunological memory, is probably facilitated by extended exposure lasting longer than two years. This is in line with the known process of B-cell maturation, in which affinity maturation and IgG predominance are encouraged by repeated antigen exposure [21].

The immune responses can be altered over time by adaptation to the environment. Chronic low-grade antigen exposure may lead to immune tolerance or more controlled responses, and long-term residents may have relatively higher levels of IgG and lower levels of IgM. Long-term exposure to the environment leads to a shift to more effective and less reactive immune profiles, consistent with similar findings from population-based immunological studies [22]. New residents may also display the immunological pattern seen with the psychophysiological stress of adjusting to dormitory life. The effects may be regulated or moderated through chronic adaptation, but there is evidence that acute stress is related to transient increases in a number of immunological markers, such as early-phase antibody responses [23]. Thus, the immunoglobulin profile of this population is likely to be shaped by a combination of behavioral and environmental factors.

CONCLUSION

The present study demonstrated that dormitory residence was associated with altered humoral immune responses among university students particularly through elevated serum IgG concentrations compared with non-dormitory. Furthermore, variations in immunoglobulin patterns according to gender and duration of dormitory residence suggest that environmental exposure and prolonged communal living may influence immune regulation. The observed increase in IgM levels among students with shorter dormitory residence may reflect early immune activation following exposure to new environmental antigens. Whereas the higher IgG levels among long term residents may indicate the development of more established adaptive immune responses. These findings highlight the potential impact of residential environment on immune status and emphasize the importance of considering lifestyle and environmental factors when evaluating immune health among university students.

Ethical Approval: The study was conducted after approval by the Research Ethics Committee at the Southern Technical University - College of Medical Technology. Verbal consent was also obtained from all study participants.

Conflict of Interest: The author declares that there is no conflict of interest in this article.

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