Original Article :

Awareness of autoimmune diseases among Saudis residing in the Western Region of Saudi Arabia

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Abstract

Background & Aims:
Autoimmune diseases (ADs) are a state where the immune system starts to attack body self-antigens. The prevalence of autoimmune diseases (ADs) is increasing globally. However, the awareness concerning these diseases is still understudied. The present study aims to assess the awareness level and explore sources of information related to ADs among Saudis living in the Western region of Saudi Arabia.

Methods:
A cross-sectional study was conducted among 701 participants that collected data related to socio-demographics, awareness level (good vs. limited), and sources of information. The data were collected using online questionnaire that was distributed via multiple social media applications.

Results:
A total of 373 male and 329 female respondents participated in the study. Only 10.1% (n= 71) had good knowledge about ADs, while the majority of participants had very limited knowledge concerning these diseases.

Conclusion:
Level of knowledge and awareness about ADs were low among Saudi western region community. The most frequent source of information was social media. This weakness of awareness may have a great impact on human life quality standardization. Therefore, these results can alert the concerned authorities such as the Ministry of Health about this weakness, especially for the ADs patients, which this knowledge can impact some treatment programs.

Key Words:
Autoimmune diseases; awareness; microbiota; non-genetic triggers; Saudi Arabia; Western region.

Introduction

Autoimmune diseases (ADs) are chronic diseases that appear when the immunological regulation starts to collapse. In these diseases, the immune system attacks the body's self-antigens which causes various pathological disorders. This has a significant economic impact because of the long-term treatment of ADs, and also the propagation of these diseases among workers can adversely influence productivity rates[1]. The worldwide prevalence of ADs is about 7.9–12.5%, while the estimated prevalence in Saudi Arabia is 4-5% [2,3]. There are more than eighty types of ADs such as rheumatoid arthritis (RA), systemic lupus erythematosus (SLE), multiple sclerosis (MS), inflammatory bowel disease (IBD) and autoimmune thyroiditis. ADs are classified into two groups: localized type, in which the self-antigens are expressed in one specific organ such as the thyroid in Hashimoto's thyroiditis, while the other group is systemic, in which the antigens are expressed vastly in various organs such as intranuclear molecules in lupus.

The normal state of the immune system is the negative response to autoantigens, which is called immunological tolerance[4]. Self-tolerance is achieved by three main methods: deletion, anergy, and suppression. The first method occurs in the primary lymphoid organs (thymus and bone marrow). In this stage, Naive lymphocytes undergo an educational process to eliminate the cells which have positively responded to self-antigens while the cells that successfully pass this stage continue for further development. The second method for autoreactive inhibition is the cell anergy stage. In this case, the cells become inactive as a result of insufficient co-stimulatory signals. This reaction is reversible which means the cells return to active state at any stage of their life. The final mechanism is cell suppression through some molecules such as cytokines (e.g. transforming growth factor-**β** [TGF-**β**]) that are produced by regulatory cells, viz, regulatory T-cells [Treg], or CD8þ T suppressor [Ts] cells [5]. This balance can be disturbed by different mechanisms, mediated by different factors.

All the ADs have common features including autoantibodies produced by plasma cells (differentiated from activated B cells), autoreactive T cells, and cell-damage caused by phagocytic cells. These features present the mechanisms that the immune system adopts to cause ADs. Autoantibodies are present mostly in all ADs, they can appear before the clinical manifestations providing a clear indicator for disease possibility. These antibodies can associate with cell damage through com-

plement cascade activation, phagocytosis, and Natural Killer cells (antibody-dependent cytotoxicity). On the other hand, autoreactive T cells and phagocytic cells cause cell damage by cytotoxic mediators such as cytokines (e.g. IFN-*y*, IL-1, TNF), prostaglandins, and reactive oxygen species (ROS) [1,5,6].

There are two main factors that interplay in ADs, genetic and environmental factors. Various genetic studies have investigated the role of different genes in these diseases and illustrate that the genetic factor does not associate with diseases susceptibility alone but also with disease phenotypes [7].

There are significant results from various studies that indicate a strong correlation between ADs and different environmental factors such as gender (females have higher rate of ADs than males), cigarette smoking, obesity, pesticides, UV rays, microbiota, stress, infections, antibiotics and other medications. These factors may be the cause of ADs or may be involved in the disease's immortalization. Many of these factors can interplay to influence immune system tolerance and produce the disease[8].

For example, overuse or misuse of antibiotics can modify gut microbiota which has a great impact on the immune system responses. Antibiotics especially in childhood can alter gut microbiota distribution and decrease its diversity (dysbiosis). Gut dysbiosis has a great impact on the immune system. One of its influences is disrupting the balance between T reg and T helper 17 cells. In addition, it has major effects on the expression of Toll Like Receptors on the antigen presenting cells (APCs). These changes can increase the body's inflammatory mileu through promoting the production of inflammatory cytokines. As a result, this condition can finally lead to the appearance of ADs [9].

A considerable number of studies point to the increasing prevalence of ADs, nevertheless, there is no clear data for the exact global ADs frequency for some countries. This can be related to some factors, the absence of a complete worldwide list of ADs is the most important one amongst them. However, some researchers have attempted to estimate the incidence of these diseases depending on previous studies [10].

Despite the increasing incidence of ADs among different gender and ethnicity, a large proportion of people are still unaware of the meaning of ADs. Therefore, it is important to increase people's awareness about these diseases which can help in early intervention and in reduction of morbidity and mortality. The first step for achieving this goal is by determining the percentage of people who possess or lack knowledge about these diseases and the appropriate methods for their education.

The aim of this research is to define the extent of awareness among the residents of the western region in the Kingdom of Saudi Arabia (KSA) regarding knowledge of ADs and the source of the information. This could be the initial stage for knowledge enhancement about ADs and may help in timely management.

Materials and methods

Study population

This was a cross-sectional study that was conducted between November 2021 and December 2021. Data were collected from adults aged >18 years who reside in the Western region of the Saudi Arabia (Makkah and Al-Madinah and their provinces). We excluded participants with medical background and participants who work at any medical institution. The sample size needed for this study was 664. This number was calculated based on the most recent census for the Western region of Saudi Arabia (population of 18 million), 5% margin of error and 99% confidence level using Raosoft (http://www.raosoft.com/samplesize.html).

Ethical approval for this research was acquired by the scientific research and ethics committee at the College of Applied Medical Sciences, Taibah University, Madinah (2021/103/102/MLT). Consent was obtained via the online questionnaire before colleting the data. The agreement of participants (years old > 18) and the aim of this study have been included on the first page of the survey. The study protocol conforms to the ethical guidelines of the 1975 declaration of helsinki as reflected in a prior approval by the institution's human research committee.

Data collection

An online questionnaire (Google Forms) was distributed in Arabic via multiple social media applications (WhatsApp, Snapchat and Twitter). The questionnaire collected information concerning sociodemographic characteristics of participants including age, gender (male; female), education level (< high-school; high-school; Graduate; postgraduate), and nationality (Saudi; non-Saudi).

Assessment of awareness level

Data concerning the awareness level were collected using eight items that were adopted and modified from previous work 16. Expert validation was done after translating the items using forward-backward translation. A pilot study was conducted among 30 participants to assess the reliability of the tool used. A Cronbach's alpha test show a good level of reliability (0.72). The tool used to assess the awareness level included eight items which are: 1) The concept of autoimmune disease. 2) Are these

inherited diseases. 3) Are these contagious diseases .4) Are these diseases chronic.5) If these diseases have lethal complications. 6) Are there specific symptoms can be realized in early stage. 7) Examples of some autoimmune diseases and microbial diseases and choose the correct examples. 8) The factors that trigger these diseases. All these questions are closed-ended questions. All these questions are dichotomous questions (Yes or No) questions, except questions 1, 7 and 8 are multiple choice questions.

Items used to assess awareness level were given scores based on response (correct response score one point and not correct response score zero point. Participants with a score less than 60% of the total score were considered to have a limited awareness level, while good knowledge was considered if he had a score of 60% of the total awareness level or more [11].

Assessment of sources of information related to autoimmune diseases

This questionnaire includes a question to assess participant's information sources including: physician, social media, family, friends and Television (TV).

Data analysis

The statistical software IBM SPSS version 22 (SPSS, Inc. Chicago, IL) was used to analyse the data collected. All statistical tests were assessed using two-tailed tests and alpha=0.05. Descriptive data are presented as frequency and percent. Chi-square or Fishers Exact test were used to assess the association between participants' awareness level regarding ADs (good vs. limited awareness level) and characteristics of participants.

Results

Sociodemographic characteristics of participants

A total of 702 participants fulfilling the inclusion criteria completed the study questionnaire. Participants age ranged from 18 to more than 50 years with a mean age of 32.6 ± 11.7 years Table (1). 53% of the participants (n= 373) were males. As for education, 435 participants (61.9 %) had university level of education, while 228 participants (32.5%) had high school level of education. A total of 658 participants (93.7%) were Saudis. Only 20 participants (2.80%) reported having a minimum of one AD. Likewise, 137 participants (19.5%) knew others with ADs who were either relatives (41.6%), friends (19%), parents (10.2%), son/daughter (8%) or brother / sister (7.3%).

Knowledge related to autoimmune diseases

Knowledge regarding ADs among study participants was evaluated in the western

able1. Sociodemographic characteristics of the study sample (n= 702).

18-29 Years	276	39.3
30-39 Years	204	29.1
40-49 Years	179	25.5
≥ 50	43	6.10
Gender		
Male	373	53.1
Female	329	46.9
Educational level		
Below high school	39	5.6
High school	228	32.5
University / postgraduate	435	62.0
Nationality		
Saudi	658	93.7
Non-Saudi	44	6.3
Do you have any autoimmune disease?		
Yes	20	2.8
No	682	97.2
Do you know someone with an autoimmune disease?		
Yes	137	19.5
No	565	80.5
Who is that person?		
Son/daughter	11	8.0
Parents	14	10.2
Brother / sister	10	7.3
Relatives	57	41.6
Friends	26	19.0
Others	19	13.9

region of Saudi Arabia. Among 702 participants, only 71 participants (10.1%) had a good level of knowledge, while 631(89.9%) had limited knowledge (Fig. 1). 190 (27.1%) participants correctly defined AD Table (2). Furthermore, only 252 (35.9%) knew that ADs are hereditary. Regarding types of ADs, the most reported were SLE (34.5%), followed by multiple sclerosis (22.6%), vitiligo (19.9%), psoriasis (16.4%), and osteoarthritis (16.2%). A total of 149 (21.2%) study participants were aware that ADs are not contagious, 355 (50.6%) considered ADs as chronic diseases such as hypertension and diabetes, while only 64 (9.1%) knew that there are no symptoms of ADs that help in early diagnosis. A total of 420 (59.8%) participants reported that if ADs are not treated, they can cause complications that may lead to death. Regarding risk factors of ADs, the most known were faulty nutritional habits (32.3%), followed by obesity (30.8%), smoking (23.1%), microbial infections (20.1%), gender (18.4%), some drugs (15.85), and anxiety/stress (14.2%). The least known was gastric microbe imbalance (10%).

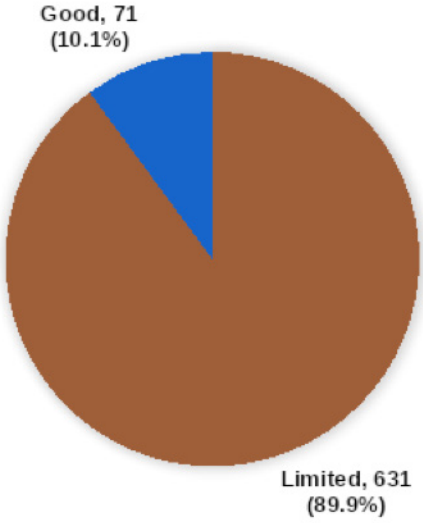


Figure 1: Knowledge related to autoimmune diseases

Table 2. Awareness regarding autoimmune diseases among study participants in the Western region of Saudi Arabia.

Awareness items		n	%
How do you describe autoimmune diseases?	The immune system fights and destroys the body cells	190	27.1
	The immune system fights germs	277	39.5
	The immune system cannot do its job	107	15.2
	I don't know	128	18.2
Are autoimmune diseases hereditary?	Yes	252	35.9
	No	192	27.4
	I don't know	258	36.8
Which of the following is considered an autoimmune disease?	I don't know	219	31.2
	SLE	242	34.5
	Osteoarthritis	114	16.2
	Multiple sclerosis	159	22.6
	Psoriasis	115	16.4
	Vitiligo	140	19.9
	TB	169	24.1
	Measles	81	11.5
	Poliomyelitis	107	15.2
Are autoimmune diseases contagious?	Yes	76	10.8
	No	269	38.3
	I don't know	357	50.9
Are autoimmune diseases considered chronic diseases such as hypertension and diabetes?	Yes	355	50.6
	No	149	21.2
	I don't know	198	28.2
Are there symptoms of autoimmune diseases that help in early diagnosis?	Yes	339	48.3
	No	64	9.1
	I don't know	299	42.6
If autoimmune diseases are not treated, they can cause complications that may lead to death	Yes	420	59.8
	No	54	7.7
	I don't know	228	32.5
Risk factors of auto-immune diseases	I don't know	254	36.2
	Faulty nutritional habits	227	32.3
	Obesity	216	30.8
	Smoking	162	23.1
	Microbial infections	141	20.1
	Gender	129	18.4
	Some drugs	111	15.8
	Anxiety / stress	100	14.2
	Ultraviolet rays	96	13.7
	Chemical / insecticides	87	12.4
	Gastric microbe imbalance	70	10.0

Source of information regarding auto-immune diseases among study participants

The most reported known source was social media (n= 207, 56.4%), followed by physicians (n=48, 13.1%), family (n=47, 12.8%), friends (n=35, 9.5%), and TV (n=30, 8.2%) (Fig. 2).

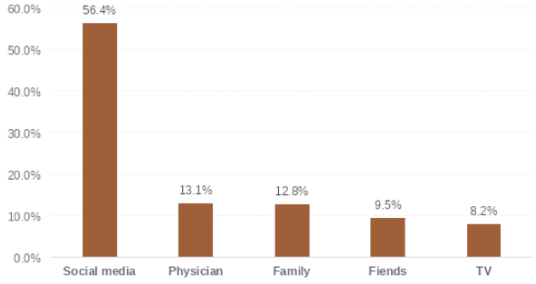


Figure 2: Source of information regarding auto-immune diseases among study participants

Distribution of knowledge level regarding auto-immune diseases by participants' socio-demographic data

13.1% of female participants had a good knowledge level compared to 7.5% of males (P=0.015). Moreover, 35% of those who had AD had a good knowledge about the disease versus 9.4% of other AD patients (P=0.001). Additionally, good knowledge was detected among 17.5% of participants who knew someone with an AD versus 8.3% of those who did not (P=.001). The total percentage of participants who have good knowledge is 24.6 % (n= 31) among ADs patients and/or know someone who has AD Table (3).

Table 3. Distribution of knowledge level regarding auto-immune diseases by participants socio-demographic data

Socio-demographics	Awareness level				
	Limited		Good		p-value
Age in years	n	%	n	%	
18-29	251	90.90	25	9.10	0.411
30-39	186	91.20	18	8.80	
40-49	155	86.60	24	13.40	
50+	39	90.70	4	9.30	
Gender					0.015*
Male	345	92.50	28	7.50	
Female	286	86.90	43	13.10	
Educational level					0.301
Below secondary	36	92.30	3	7.70	
Secondary	210	92.10	18	7.90	
University / above	385	88.50	50	11.50	
Nationality					0.776$
Saudi	592	90.0	66	10.0	
Non-Saudi	39	88.60	5	11.40	
Do you have any autoimmune disease?					0.001*
Yes	13	65.0	7	35.0	
No	618	90.60	64	9.40	

Socio-demographics	Awareness level				
	Limited		Good		p-value
Do you know someone with an autoimmune disease?					
Yes	113	82.50	24	17.50	0.001*
No	518	91.70	47	8.30	
Source of information					
Physician	42	87.50	6	12.50	0.170$
Social media	190	91.80	17	8.20	
TV	29	96.70	1	3.30	
Family	38	80.90	9	19.10	
Friends	33	94.30	2	5.70	

$: Fisher Exact test was used to obtain p-value

* Significant at 95% confidence level.

Discussion

Awareness and knowledge are important factors to control various chronic diseases such as ADs. In this study, we estimated the awareness of 702 residents in the western region of Saudi Arabia. There was a great variation in the overall knowledge level regarding ADs among the study participants. Of these, 10.1% of participants had a good knowledge while the others (89.9%) had limited knowledge. Interestingly, women comprised a higher percentage of participants with good knowledge about ADs than men. This could be related to many factors: one of the important reasons could be the higher prevalence of these diseases among females compared to males which necessitated them to search and read about ADs [12]. In different studies, it has been indicated that women possessed a higher frequency reading compared to men [13]. Furthermore, research conducted to illustrate the differences in social media usage among gender have found that females had the overwhelming result, regardless of the goal [14]. Additionally, the nature of women also enriches her health database because she is mostly a mother [15]. A study conducted in Germany found that females have been engaged in health information online search more than males [16]. As well as, the fact that women are more social and have greater and diversified social networks than men [17], they -get ample opportunity to gather diverse information, related to health and diseases besides other topics.

It has been also revealed from our study that there are significant results regarding people who have AD, and/or knew someone who has, compared with the other participants; this gives more opportunity to engage and know about the topic. However, it is still low than expected from this group (24.6%, n= 31) especially for ADs

patients (35%, n=7) who should have complete knowledge about their medical condition. Lack of communication is the main factor that can impact on patient's knowledge. This insufficient communication may be related to different barriers such as language, time limitation and using medical terms by physicians [18]. On the other hand, these results might change if the number of this group increased. Although there is no significant result related to the educational level, all participants who had good knowledge about ADs had a qualification equivalent to Bachelor's degrees and above, it could be due to their high percent (61.9%).

Usually, most non-medical persons relate the term 'immune system' to germs and body's defenses alone which is clearly evident in the results of this survey. A high percentage of the participants (39.5%) defined and described ADs as the human body's defense against germs. On the other hand, 27% of them who possessed good knowledge, defined these diseases appropriately. Therefore, it is important to organize educational and awareness sessions for the community regarding ADs. This can be determined depending on the method that the community is attracted to.

It is notable from the results that the major source that participants relied on to gain information was social media (56.4%, n=207). Despite that, only a few have good knowledge. This indicates the importance of social media as a significant mean to increase awareness to the largest population proportion as possible. Different studies illustrate the impact of social media on community knowledge which considered as the main method are used for information search [19]. Therefore, it is imperative to enhance the quality of its content and use it as an effective mean of delivering valid information. On the other hand, among the source of information family presents the highest method includes participants with good knowledge (19.1%). This might be related to the probability of the presence of AD patient in their family, which increase their chance to have valid knowledge.

ADs are caused by two main factors that interplay with each other, genetic and environmental [20]. In this questionnaire regarding whether ADs are inherited and contagious diseases or not, there are conflicts of opinion. Concerning hereditary, this might relate to different reasons, of which the most notable could be the prevalence of these diseases among some family members who do not have history of ADs. In this condition, environmental etiology may play a significant role. Genetic predisposition presents around 30% of ADs, while environmental factors are responsible for the rest [21]. Regarding en-

vironmental factors, there are many examples, however, we chose some factors and examined participants' knowledge about their involvement as risk factors. As it is evident in these results, among the factors, wrong nutritional habits and obesity had the highest proportion. Both factors are relatively related to each other, therefore participants who chose one included the other. Some studies indicated that obesity is considered as a high risk factor predisposing to ADs because it is a fertile inflammatory environment as a result of the production of pro-inflammatory mediators 'adipokines' [22]. Various researches illustrate the relationship between faulty nutrition and ADs. Many factors have been presented as the reasons as to why faulty nutrition has a strong impact on ADs appearance. All these factors can increase inflammation that leads to ADs. In the beginning, the gastrointestinal system encounters numerous antigens in food which puts the immune system under constant fight with these antigens. Moreover, different types of food such as fat food can stimulate inflammation through inflammatory cytokines production [23]. Many studies have focused on the importance of nutrition and linked it to a high rate of mortality (up to 60 %); however, World Health Organization expects that the percentage would increase [24]. Likewise, food companies, because of their competition with each other, contributed to increasing social awareness of a healthy diet to reduce the risk of diseases. Besides this, physicians, nutritional specialists and different health care organizations participate in imparting educational awareness about predisposing factors to ADs. All these factors may reinforce the reason for choosing nutrition and obesity as risk factors of ADs, which bring it to the forefront. On the other hand, smoking and microbial infections are other contributing factors. Certainly, almost all the participants had prior knowledge that both of these factors were related to different diseases. It has been indicated that smoking can trigger some types of ADs by stimulating oxidative stress production and DNA demethylation, also it can alter the lung microenvironment which can change immune responses to respiratory infections [25]. On the other hand, infections especially viral infections, such as Epstein Barr virus (EBV) and Cytomegalovirus (CMV), can stimulate autoantibodies production that leads to ADs appearance [26]. The other factors have different responses but the most noticeable was the last and least selective element which is gut microbiota imbalance (dysbiosis). This factor according to various researches is the most important since most of the previous factors may result finally in dysbiosis [27].

Despite its importance, it was expected to be the lowest choice for the participants in our study since it' knowledge relatively needs specialists or someone involved in the medical field.

In regard to the question about AD examples, the most cited example that has been chosen and known by the participants was Systemic Lupus Erythematosus (SLE). The prevalence rate of SLE in Saudi Arabia likewise in some other countries is still statistically low although different statistical studies have been applied in different regions in KSA. A study conducted in the central region, specifically Riyad city included 624 SLE diagnosed patients in King Khalid hospital during a period from 1890 to 2006 [28]. A recent study from the Al-Qassim region reported that SLE prevalence approximated to 19.28 per 100,000 population in the region [29,30]. An increase in the rate of this disease is expected in KSA owing to a steady increase in ADs incidence, in general, around the world 10. The high incidence, coupled with multiple studies and keenness to spread awareness about this disease could be the reason for SLE being the highest option among the other ADs by the participants. Likewise, the prevalence of multiple sclerosis is rising with an estimated ratio in the country being 40.40 per 100,000 total population[31]. However, it is still less known among the study participants and less widespread than SLE. On the other hand, 50% of the participants included microbial diseases (such as measles, Tuberculosis (TB) and poliomyelitis) within ADs which might present one of the main causes for ADs. As per their knowledge, ADs implies that the immune system fights or attacks microorganisms. This is the idea about ADs as is obvious from the overwhelming response of many participants in this questionnaire, which needs to be rectified by dissemination of the correct information and increasing the awareness among the community. Different methods can be chosen to deliver and share this knowledge along with educational campaigns may bridge the gap in knowledge and promote early detection and management of ADs.

Conclusion

Autoimmune diseases are one of the significant diseases that have a great impact on human quality of life. Although the prevalence of these diseases is increasing, the awareness concerning these diseases is still understudied. The goal of this study is to evaluate the awareness level and explore sources of information related to ADs among Saudis living in the Western region of Saudi Arabia. A cross-sectional study was conducted among 702 participants that collected data related to socio-demo-

graphics, awareness level (good vs. limited), and sources of information. The data were collected using online questionnaire that was distributed via multiple social media applications. The results show a significant limitation since only 10.1% (n= 71) had good knowledge about ADs, while the majority of participants had very limited knowledge concerning these diseases. In this current study, it is clear that there is a knowledge and awareness gap in Saudi western society regarding the concept of ADs. Therefore, an effort must be made to bridge the knowledge gap and choose the most appropriate method for that. Among the sources of ADs information, social media clearly present the highest prevalence among other sources. To sum up, attention needs to be paid to promote medical and health knowledge in the community in order to attain adequately healthy well-being. There are different methods that can be approved by the Mistry of Health to provoke awareness about ADs such as social media as we mentioned before, posters and workshops. On the other hand, this is local study that can`t be generalized which is one of the study limitations. Moreover, online questionnaire doesn`t guarantee access to different types of groups. Therefore, this study can be extended to cover all Saudi Regions to assess the shortage and create the proper solutions.

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