International Journal of Advanced Research in Biological Sciences
ISSN: 2348-8069
www.ijarbs.com
Volume 3, Issue 6 - 2016

Research Article

SOI: http://s-o-i.org/1.15/ijarbs-2016-3-6-21

Selective immunoglobulin A deficiency in autoimmune diseases

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Abstract

Background: Selective immunoglobulin A deficiency (SIgAD) is the most common primary immunodeficiency in which patients were found to have a greater risk of concomitant autoimmune disorders than healthy individuals. The exact mechanism underlying this relationship is not fully understood. **Aim of the study:** Our study aimed to evaluate the frequency of SIgAD in patients with autoimmune diseases. **Subjects and methods:** This study included one hundred patients diagnosed to have autoimmune disease and twenty healthy controls. Serum Ig A, G and M were measured in all subjects by ELISA. **Results:** The results of the study revealed highly statistically significant evidence of selective IgA deficiency among cases having different autoimmune diseases included in our study in comparison to controls who had normal IgA levels. There was highly statistically significant inverse correlation between age and serum IgA level in patients on the other hand no relation between IgA level and neither duration of illness nor gender. **Conclusion:** There is a link between selective IgA deficiency and various autoimmune diseases which requires further investigations on wider scales to detect the possible pathophysiological mechanisms.

Keywords: selective IgA deficiency, autoimmune diseases, primary immunodeficiency.

Introduction

Immune deficiencies and autoimmune diseases seem like opposite sides of a coin, however autoimmune diseases is frequently found in people with deficient immune systems and autoimmune patients are frequently sick **(Pan-Hammarström and Hammarström, 2008).** Immune deficiency is impaired ability of the immune system to fight infection, whereas autoimmunity is an exaggerated response of the immune system to a person's own body tissues or organs. Even though, it seems that the two conditions are of opposite response, the common theme is that both represent dysfunction of the immune system **(Lauren, 2009).**Accordingly, they may be much more closely related than their opposite definitions would imply. Autoimmune diseases represent a malfunction of the normal immune process, in which the immune system attack healthy self-cells and tissues involving both T-cell and B-cell responses and this is triggered by many factors e.g; genetic, environmental including infectious and noninfectious factors and loss of self-tolerance **(Davidson and Diamond, 2006).**Selective immunoglobulin A deficiency (IgAD) is the most common primary immunodeficiency which is defined by the Pan-American Group for Immunodeficiency and the European Society for Immunodeficiencies, as serum IgA levels <0.07 g/L in the presence of normal IgM and IgG levels in individuals' ≥4 years of age **(Notarangelo et al., 2009)**.

There may be common causes and effects for both immune deficiency and autoimmune disease, and

researchers are discovering a lot of similar ground for study. Untangling this relationship between immune deficiency and autoimmune disease is a bit like playing which came first, the chicken or the egg **(Lauren, 2009)**.Various studies reveled that susceptibility to infection is a big part of the burden of autoimmune disease and their treatments as reported clinically by doctors and patients that a major complication for lupus, scleroderma and other patients with autoimmune disease is the generalized increase in the frequency and severity of all types of infections, although exact statistics could not be detected**(Janzi et al., 2009).**

Most individuals with IgAD are clinically asymptomatic, however recurrent respiratory and gastrointestinal tract infections/disorders, autoimmunity and allergies may be associated with IgAD **(Latiff and Kerr, 2007)**. IgAD is strongly associated with the major histocompatibility complex (MHC) region, particularly the human leukocyte antigen (HLA)-B8, DR3, DQ2 (8.1) haplotype **(Cunningham-Rundles et al., 1991)**, and at least one copy of this haplotype is present in 45% of IgAD patients compared to 16% in the general population. Even further homozygosity for the ancestral 8.1 haplotype increases the risk of development of the disease **(Mohammadi et al., 2010)**, which is also reported to be associated with various autoimmune diseases as Graves' disease (GD), systemic lupus erythematosus (SLE), type 1 diabetes (T1D) and celiac disease (CeD) **(Ramanujam et al., 2011)**.IgAD is thought to be present from birth in most cases and theoretically, increased frequency of infections due to IgAD could precipitate autoimmune disorders such as GD and SLE. However, in CeD, IgAD has occasionally been reported to occur after the onset of the gastrointestinal symptoms. Thus, the main contributor to the different autoimmune disorders is the common genetic background whereas environmental factors determine if, and when, the primary and subsequent diseases will appear **(Yel, 2010).**Therefore the aim of this study is to evaluate the frequency of Selective immunoglobulin A deficiency in patients with autoimmune diseases and highlighting its possible pathophysiological mechanisms.

Subjects and Methods

Subjects:

This case control study was conducted on one hundred patients diagnosed to have an autoimmune disease ranging from 20 to 60 years of age and twenty healthy individuals as a control group. The clinical component of the study was conducted between June 2015 to February 2016. Patients were recruited from Ain Shams University clinic (endocrinology, immunology, gastroenterology, hematology and rheumatology clinic). A questionnaire was completed for all patients to record demographic data, family and detailed history of documented autoimmunity, recurrent and chronic infections, clinical and laboratory data(e.g. CBC, liver function, kidney function, ESR, ANA, Anti-DNA, ANCA, ASMA, Antimicrosomal antibodies, Coomb's test) of autoimmune diseases and serum immunoglobulin A, M,G by (ELISA).The diagnosis of autoimmune diseases was based on clinical and laboratory findings guided by the standard criteria **(Radenbach et al., 1971; Wang et al., 2015)**. Patients on current medications that might affect the results of the study, patients with organ failure or severely ill, pregnant females, patients with low serum level of IgM or IgG and patients with concomitant diseases that might affect the results of the study were excluded. An informed consent was obtained from all participants, and the study was approved by the Research Ethics Committee of Faculty of medicine-Ain Shams University.

Methods:

Serum immunoglobulin A by ELISA:

It is a quantitative sandwich enzyme immunoassay technique that measures human IgA in less than 4 hours. A polyclonal antibody specific for human IgA has been pre-coated onto a 96-well microplate with removable strips. IgA in standards and samples was sandwiched by the immobilized antibody and the biotinylated polyclonal antibody specific for IgA, which was recognized by a streptavidin-peroxidase conjugate. All unbound material was washed away and a peroxidase enzyme substrate was added. The color development was stopped and the intensity of the color was measured**(Yel, 2010).**

Statistical Methodology:

Data were analyzed using PASW version 18 (IBM© Corp., Armonk, NY, USA). Normality of data was tested using D'Agostino-Pearson test, normally distributed numerical variables were presented as mean ± SD. Numerical data were compared using unpaired student t test or ANOVA test. Correlations were done using Spearmann's coefficient. Data were tabulated and significant results were graphically illustrated. P value of >0.05 was considered

statistically insignificant, $p \leq 0.05$ was considered statistically significant and $p \leq 0.001$ was considered highly significant.

Results

This case control study included one hundred patients diagnosed to have an autoimmune disease ranging from 20 to 60 years of age attending the Ain Shams University clinic and twenty healthy subjects as a control group. Demographic data as regard age and sex between case and control was found to be statistically insignificant as shown in table 1.

Table (1): Demographic data among both studied groups.

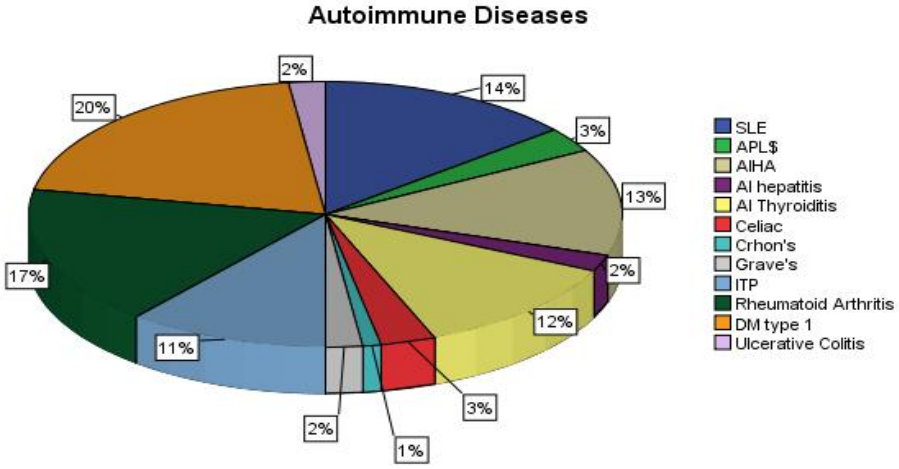
		Case (n. 100)	Control (n. 20)	P Value
Age		34.97 ± 10.1	31.9 ± 7.33	0.198
Gender	**Female**	75 (75%)	14 (70%)	0.641
	Male	25 (25%)	6 (30%)	

Different autoimmune diseases involved in our study showed high frequency of type1 diabetes mellitus (T1DM) 20%, Rheumatoid Arthritis (RA) 17%, Systemic lupus erythematosus (SLE) 14%, Autoimmune hemolytic anemia (AIHA) 13%, Autoimmune thyroiditis 12%, Idiopathic thrombocytopenic purpura (ITP) 11% on the other hand low frequency of crohn's disease 1%, ulcerative colitis 2%,Autoimmune hepatitis 2%, Graves' disease 2%, celiac disease 3%, Antiphospholipid syndrome (APL$) 3% as also shown in table 2 and figure 1.

Table (2): Frequency of the different autoimmune diseases among cases.

	Frequency	Percent
SLE	14	14.0
APL$	3	3.0
AIHA	13	13.0
AI hepatitis	2	2.0
AI Thyroiditis	12	12.0
Celiac	3	3.0
Crohn's	1	1.0
Graves'	2	2.0
ITP	11	11.0
Rheumatoid Arthritis	17	17.0
DM type 1	20	20.0
Ulcerative Colitis	2	2.0
Total	100	100%

Figure 1: Frequency of different autoimmune disease involved in this study

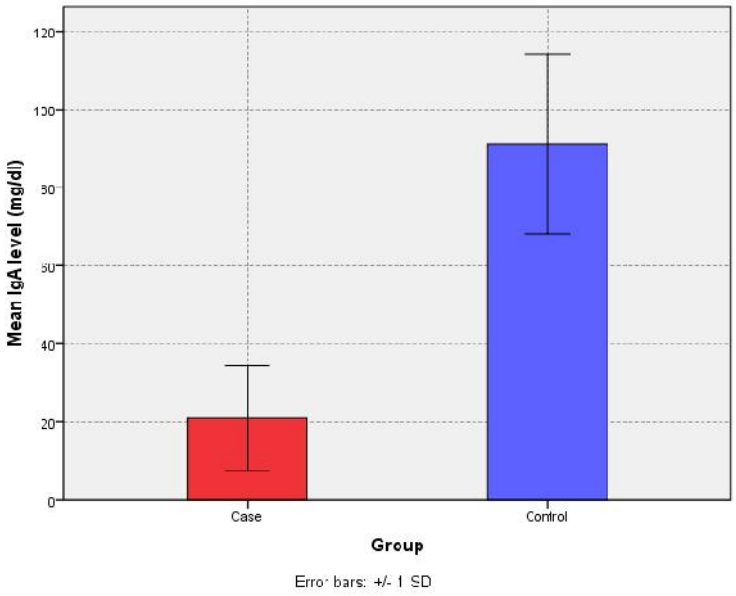


Regarding serum IgA between both studied groups (case and control), there was highly statistically significant decrease in serum IgA among case group in comparison to control group with P Value 0.001 as also shown in table 3 and figure 2

Table (3): Serum IgA among both studied groups (case and control).

	Group				P Value
	Case		Control		
	Mean	± SD	Mean	± SD	
IgA level (mg/dl)	20.92	13.48	91.2	23.1	0.001

Figure 2: Comparison between case and control as regard IgA level



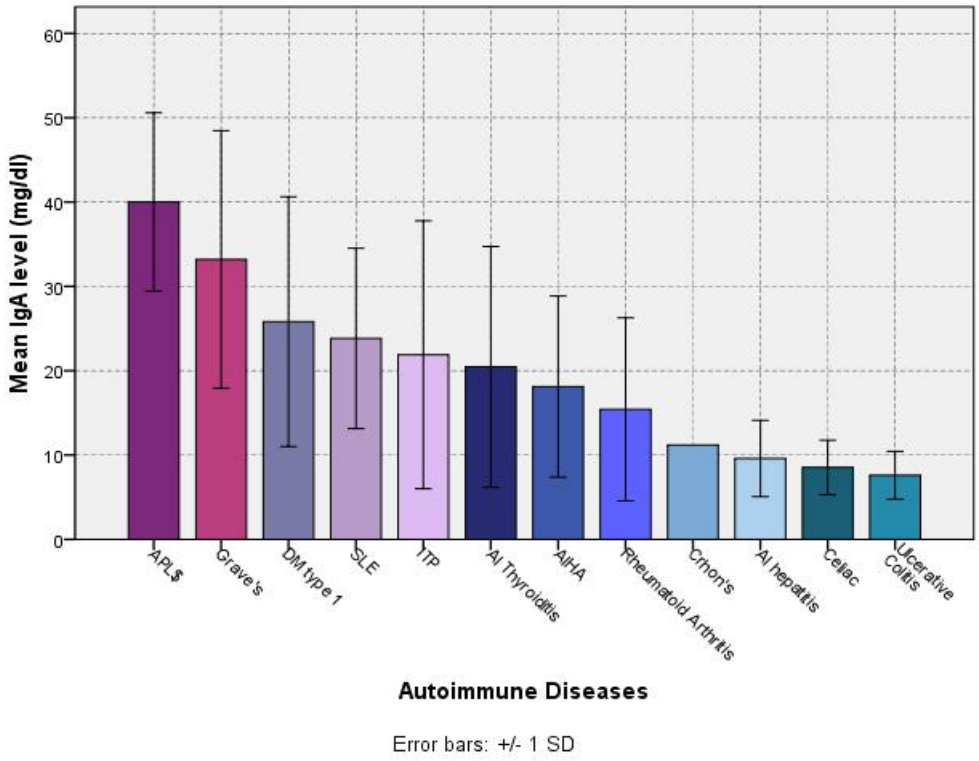
Box plot represent the comparison between case and control as regard mean IgA level (mg/dl) which is higher in control than case with highly statistically significant difference.

Variation in IgA level between different types of autoimmune diseases in this study among case group with P Value 0.026 was statistically significant as shown in table 4 and figure 3

Table (4): Serum IgA in different autoimmune diseases among group of case

		IgA level (mg/dl)		P Value
		Mean	± SD	
Autoimmune diseases	**SLE**	23.83	10.70	**0.026**
	APL$	40.00	10.58	
	AIHA	18.12	10.73	
	AI hepatitis	9.60	4.53	
	AI Thyroiditis	20.47	14.27	
	Celiac	8.53	3.23	
	Crhons	11.20	.	
	Grave's	33.20	15.27	
	ITP	21.89	15.89	
	Rheumatoid Arthritis	15.41	10.86	
	DM type 1	25.82	14.81	
	Ulcerative Colitis	7.60	2.83	

Figure 3: Variation in IgA level between different types of autoimmune diseases



Box plot showing the variation of IgA level between different autoimmune diseases in the current study with highest levels in Antiphospholipid syndrome (APL$) and lower levels in celiac disease and ulcerative colitis.

The correlation between IgA level and demographic data showed an inverse relationship between serum IgA level and age with P Value 0.003 which is statistically highly significant on the other hand no relation between IgA level and neither duration of illness nor gender among case.

Discussion

The majority of patients with IgAD (70–80%) are asymptomatic and identified coincidentally while the remaining (20–30%) may suffer from recurrent infections, allergic or autoimmune diseases **(Cunningham-Rundles, 2011).** This case control study was carried out on one hundred patients diagnosed to have an autoimmune disease ranging from 20 to 60 years of age and twenty healthy individuals served as control group. A questionnaire was completed for all patients to record demographic data, family and detailed history of documented autoimmunity, recurrent and chronic infections, clinical and laboratory data essential for diagnosis of autoimmune disease. Serum Ig A, G and M were measured in all subjects by (ELISA).Patients who were on current medications thatmay affect the results of the study, with organ failure, severely ill, pregnant females, patients with low serum level of IgM or IgG or patients with concomitant diseases that may affect the results of the study were excluded.

In the current study, we found highly statistically significant evidence of selective IgA deficiency (low serum level of IgA with normal serum Ig M andG) among cases having different autoimmune diseases included in the study in which out of 100 cases with autoimmune diseases,67%were found to have IgA deficiency and this is in line with Abo-El Hassani et al who reported that out of 57 symptomatic patients (65% males) with confirmed sIgAD, 17 cases (29.8%; 9 males and 8 females) documented to have autoimmune disorders The most common manifestations were thyroiditis, vitiligo, and hemolytic anemia (3 cases each) **(Abo-El Hassani et al., 2015).**This is also in harmony with Liblau et al. who reported sIgAD in 4.3 % of patients with juvenile idiopathic arthritis (JIA**) (Liblau and Bach, 1992),** and Cassidy et al. who identified SIgAD in up to 5.2 % of children with SLE **(Cassidy et al., 2007)**. While Pallay et al. reported that the prevalence of sIgAD in North American patients with celiac disease (CeD) is comparable with European data but not significantly different than control populations **(Pallav et al., 2016)**in contrast to our study and this can be explained by the difference in the race between the two studies and also insufficient number

of the patients having celiac disease in our study. Also an italian study reported the presence of IgA-D in eight out of the 150 subjects (children and adult patients) with type 1 diabetes who had been followed up regularly at diabetes unit in a 1-year period; therefore, IgA-D was recorded in 5.3% of the patients **(Greco and Maggio, 2015).**

The different autoimmune diseases involved in our study revealed high frequency of T1DM 20%, RA 17%, SLE 14%, AIHA 13%, Autoimmune thyroiditis 12%, ITP 11% on the other hand low frequency of Crohn's disease 1%, ulcerative colitis 2%, Autoimmune hepatitis 2%, Grave's disease 2%, celiac disease 3%, APL$ 3%. In this study, there were variations in IgA level between different types of autoimmune diseases included in the study and this was statistically significant but the higher incidence in which autoimmune disease could not be determined due to insufficient number of autoimmune diseases and not all autoimmune diseases included in our study. The current study revealed highly statistically significant inverse correlation between age and serum IgA level in patients included in this study on the other hand no relation between IgA level and duration of illness. A study of 7293 Austrian volunteers showed a greater frequency of sIgA-D in men than in women (0.19% vs 0.014%) and a greater frequency of subnormal serum IgA levels (0.07-0.7 g/L) in men (2.66%) than in women (0.93***%)*** **(Weber-Mzell et al., 2004),**on the other hand our study found no relation between serum IgA and gender and this can be explained by unequal number of male and females included in our study.

Prevalence of IgA-D has been increased in a number of autoimmune diseases **(Yel, 2010; Wang et al., 2011; Ludvigsson et al., 2014).** Edwards et al. reportedthat autoimmunity (28**%**)wasthe second most common association with IgA deficiency after recurrent infections **(Edwards et al., 2004).** Both organ-specific and systemic autoimmune manifestations were reported to be associated in 7–36 % of IgA-D patients **(Jacobson et al., 2008)** including SLE (1–5 %), RA (2–4 %), and celiac disease (10–20 %) as well as sporadic cases of thyroiditis, AHA, ITP, T1DM, MG, psoriasis, vitiligo, and pemphigus **(Arason et al., 2010; Grammatikos and Tsokos, 2012)**.

Autoimmunity is seen in several types of humoral immunodeficiencies, including sIgAD and CVID in which the mechanism of preventing the immune system from damaging self-tissues by the elimination (or negative selection) of cells that strongly react self-antigens is compromised **(Jorgensen et al., 2009).** The mechanism underlying the presence of IgAD in autoimmune diseases still remains hard to capture. Various theories were suggested including breakdown of tolerance as a result of exposure to hidden or sequestrated antigens, molecular mimicry, and presence of superantigens or antigen drift because of a cytokine environment favoring bystander activation of B cells. Additionally autoimmune T- and B-cell reactive clones might persist due to failure of apoptosis of self-reactive clones, cytokine dysregulation or failure of T-cell regulation **(Samarkos and Vaipoulos, 2005; Lopes-da-Silva and Rizzo, 2008).**

IgA is involved in the processing and clearing of external antigens from mucosal surfaces. End-organ deposition of immune complexes, chronic inflammation, tissue damage and perhaps formation of anti-tissues antibodies might occur due to defective antigen clearance. This lack of clearance of antigens from mucosal surfaces with resultant immune complex deposition leads to tissue damage and ongoing inflammation with subsequent exposure of autoantigens and breakdown in peripheral tolerance which is hypothesized to be the result of presence of autoimmune disease in IgAD **(Patiroglu et al., 2012)**.A second theory is that the lack of clearance of intraluminal antigens (from diet or pathogens) and mucosal absorption of antigens present in diet or of microbial contents with molecular mimicry to normal tissue or the exposure to superantigens leads to a breakdown of peripheral tolerance due to lack of IgA **(Arason et al., 2010; Jorgensen et al., 2013).**It even may involve a break of tolerance against IgA itself (since 30% of IgAD patients have demonstrable titers of IgG antibodies against IgA) **(Wang et al., 2011)**. A third hypothesis, is the lack of inhibitory signaling through constitutively-expressed FcαR1 in patients with IgA deficiency **(Jacob et al., 2008).**Shared genetic factors can also explain co-existance of autoimmune diseases and selective IgAD. Both major histocompatibility complex (MHC) and non-MHC genes contribute to susceptibility to IgA deficiency in which the latter show a marked overlap with genes associated with a variety of autoimmune disorders including Graves' disease, systemic lupus erythematosus, type 1 diabetes and celiac disease **(Wang and Hammarström, 2012) ,**furthermore this theoryis supported by increased prevalence of autoimmune disorders among first-degree relatives of patients with IgA deficiency (**Jorgensen et al., 2013)**.

IgAD has been also associated with variants within the Interferon-induced helicase C domain-containing protein 1 gene (IFIH1) as revealed by Ferreira et al .which in previous studies found to associated with type 1 diabetes and systemic lupus erythematosus and this further links IgAD and autoimmunity. Additionally, a suggestive association has been found with IgAD and variants within the C-type lectin domain family 16 gene (CLEC16A), a known autoimmune locus **(Ferreira et al., 2010)**. These findings draw a connection between sIgAD and an autoimmune diathesis, although further studies are necessary to show causality **(Wang et al., 2011).** Similarities in the genetic susceptibility suggest involvement of common pathophysiological pathways, implicating that IgAD may in fact be an autoimmune disease as suggested by **Ferreira et al.**, **2010**. However, additional dense sequencing of the implicated genes may be required to fully understand the mechanisms involved.

The current challenge was to evaluate the frequency of selective IgA deficiency in patients with autoimmune diseases and highlighting its possible pathophysiological mechanisms. There was high prevalence of IgA deficiency found in 67% of patients with autoimmune diseases involved in our study. This study revealed variation in IgA level between different types of autoimmune diseases included in the study which was statistically significant but the higher incidence in which autoimmune disease could not be determined.

In conclusion, the current study provided a link between IgA deficiency and various autoimmune diseases which requires further investigations on wider scales to detect the different pathophysiological mechanisms. Further multicenter studies are needed to estimate prevalence of selective IgA deficiency in autoimmune diseases as it is under recognized and patients from other countries, other races, different gender and age should be considered. More studies are recommended to realize the link between immunodeficiency, infection and autoimmunity.

Conflicts of interest:

The authors declare that no funding or grant was received for the study and that they have no conflict of interest, financial or personal relationship related to the study.

References

1. **Abolhassani H, Gharib B, Shahinpour S, Masoom SN, Havaei A, Mirminachi B, Arandi N, Torabi-Sagvand B, Khazaei HA, Mohammadi J, Rezaei N and Aghamohammadi A (2015):** Autoimmunity in patients with selective IgA deficiency. J Investig Allergol Clin Immunol; 25(2):112-119.
2. **Arason GJ, Jorgensen GH and Ludviksson BR (2010):** Primary immunodeficiency and autoimmunity: lessons from human diseases. Scandinavian journal of Immunology; 71(5): 317-328.
3. **Cassidy JT, Kitson RK and Selby CL (2007):** Selective IgA deficiency in children and adults with systemic lupus erythematosus. Lupus; 16(8): 647-650.
4. **Cunningham-Rundles (2011):** Autoimmunity in primary immune deficiency: taking lessons from our patients. Clin Exp Immunol. Jun; 164 Suppl 2:6-11
5. **Cunningham-Rundles C, Fotino M, Rosina O and Peter J B (1991):** Selective IgA deficiency, IgG subclass deficiency, and the major histocompatibility complex. Clinical immunology and immunopathology; 61(2): S61-S69.
6. **Davidson A and Diamond B (2006):** Autoimmune diseases. N Engl J Med; 345(5): 340-350.
7. **Edwards E, Razvi S and Cunningham-Rundles C (2004):** IgA deficiency: clinical correlates and responses to pneumococcal vaccine. Clin Immunol; 111(1):93-97.
8. **Ferreira RC, Pan-Hammarström Q, Graham RR, Gateva V, Fontán G, Lee AT, Ortmann W, Urcelay E, Fernández-Arquero M, Núñez C, Jorgensen G, Ludviksson BR, Koskinen S, Haimila K, Clark HF, Klareskog L, Gregersen PK, Behrens TW and Hammarström L (2010):** Association of IFIH1 and other autoimmunity risk alleles with selective IgA deficiency. Nature genetics; 42(9): 777-780.
9. **Grammatikos AP and Tsokos GC(2012):Immunodeficiency and autoimmunity: lessons from systemic lupus erythematosus.** Trends Mol Med.; 18(2):101-108.
10. **Greco D and Maggio F (2015):** Selective Immunoglobulin A Deficiency in Type 1 Diabetes Mellitus: A Prevalence Study in Western Sicily (Italy). Diabetes Metab J; 39(2): 132–136.

11. **Jacob CM, Pastorino AC, Fahl K, Carneiro-Sampaio M and Monteiro RC. (2008):** Autoimmunity in IgA deficiency: revisiting the role of IgA as a silent housekeeper. J Clin Immunol; 28 (Suppl 1):S56–S61.
12. **Jacobson EM, Huber A and Tomer Y (2008):** The HLA gene complex in thyroid autoimmunity: from epidemiology to etiology. Journal of autoimmunity; 30(1): 58-62.
13. **Janzi M, Kull I, Sjöberg R, Wan J, Melén E, Bayat N, Ostblom E, Pan-Hammarström Q, Nilsson P and Hammarström L (2009):** Selective IgA deficiency in early life: association to infections and allergic diseases during childhood. Clinical immunology; 133(1): 78-85.
14. **Jorgensen GH, Gardulf A, Sigurdsson MI, Sigurdardottir ST, Thorsteinsdottir I, Gudmundsson S, Hammarström L and Ludviksson BR (2013):** Clinical symptoms in adults with selective IgA deficiency: a case-control study. Journal of clinical immunology; 33(4): 742-747.
15. **Jorgensen GH, Thorsteinsdottir I and Gudmundsson S (2009):** Familial aggregation of IgAD and autoimmunity. ClinImmunol; 131:233
16. **Latiff AHA and Kerr MA (2007):** The clinical significance of immunoglobulin A deficiency. Annals of clinical biochemistry; 44(2): 131-139.
17. **Lauren Gerstmann (2009):** Immune Deficiency and A complicated relationship**.** The causes and effects of immune deficiency and autoimmune disease may have a lot in common, and researchers are discovering a lot of similar ground for study. IG. Living Magazine; June-July: 28-32
18. **Liblau R and Bach JF (1992):** Selective IgA deficiency and autoimmunity. International archives of allergy and Immunology; 99(1): 16-27.
19. **Lopes-da-Silva S and Rizzo LV (2008):** Autoimmunity in common variable immunodeficiency. Journal of clinical immunology; 28(1): 46-55.
20. **Ludvigsson JF, Neovius M and Hammarström L (2014):** Association between IgA deficiency & other autoimmune conditions: a population-based matched cohort study. Journal of clinical immunology; 34(4): 444-451.
21. **Mohammadi J, Ramanujam R, Jarefors S, Rezaei N, Aghamohammadi A, Gregersen PK and Hammarström L (2010):** IgA deficiency and the MHC: assessment of relative risk and microheterogeneity within the HLA A1 B8, DR3 (8.1) haplotype. Journal of clinical immunology; 30(1): 138-143.
22. **Notarangelo LD, Fischer A, Geha RS, Casanova JL, Chapel H, Conley ME, Cunningham-Rundles C, Etzioni A, Hammartröm L, Nonoyama S, Ochs HD, Puck J, Roifman C, Seger R, Wedgwood J and Ochs HD (2009):** Primary immunodeficiencies: 2009 update. Journal of Allergy and Clinical Immunology; 124(6): 1161-1178.
23. **Pallav K, Xu H, Leffler DA, Kabbani T and Kelly CP (2016):** Immunoglobulin A deficiency in celiac disease in the United States. J Gastroenterol Hepatol; 31(1):133-137.
24. **Pan–Hammarström Q and Hammarström L (2008):** Antibody deficiency diseases. European journal of immunology; 38(2): 327-333.
25. **Patiroglu T, Gungor H and Unal E (2012):** Autoimmune diseases detected in children with primary immunodeficiency diseases: results from a reference centre at middle anatolia. ActamicrobiologicaetimmunologicaHungarica; 59(3): 343-353.
26. **Radenbach KL, Brandt HJ, Preussler H and Rudolph H.(1971)**: Criteria for the diagnosis of exsudative pleurisy due to autoimmune diseases. Results of diagnostic examinations in pleurisy associated with rheumatoid arthritis, Sjogren's syndrome and lupus erythematosus. Pneumonologie; 145: 224-237.
27. **Ramanujam R, Piehl F, Pirskanen R, Gregersen PK and Hammarström L (2011):** Concomitant autoimmunity in myasthenia gravis—lack of association with IgA deficiency. Journal of Neuroimmunology; 236(1): 118-122.
28. **Samarkos M and Vaipoulos G (2005):** The role of infections in the pathogenesis of autoimmune disease. Curr. Drug. Targetsinflamm. Allergy; 4(1): 99-103.
29. **Wang L, Wang FS and Gershwin ME (2015):** Human autoimmune diseases: a comprehensive update. Journal of internal Medicine; 278(4): 369-395.
30. **Wang N and Hammarström L (2012):** IgA deficiency: what is new? Current opinion in allergy and clinical Immunology; 12(6): 602-608.
31. **Wang N, Shen N, Vyse TJ, Anand V, Gunnarson I, Sturfelt G, Rantapää-Dahlqvist S, Elvin K, Truedsson L, Andersson BA, Ortqvist E, Gregersen PK, Behrens TW, Hammarström L and Dahle C (2011):** Selective IgA deficiency in autoimmune diseases. Mol Med; 17(11-12): 1383-1396.

32. **Weber-Mzell D, Kotanko P, Hauer AC, Goriup U, Haas J, Lanner N and Lanzer G (2004):** Gender, age and seasonal effects on IgA deficiency: a study of 7293 Caucasians. European journal of Clinical Investigation; 34(3): 224-228.
33. **Yel L (2010):** Selective IgA deficiency. J Clin Immunol; 30(1):10-16.

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How to cite this article:
Fawzia Hassan Ahmed Abo-Ali, Sonya Ahmed Ali Elgaaly, Mariam Maged Amin Doss, Noha Mohammed Abdalla. (2016). Selective immunoglobulin A deficiency in autoimmune diseases. Int. J. Adv. Res. Biol. Sci. 3(6): 158-166.