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Psychosocial and Socioeconomic Impacts of Atopic Dermatitis: A Comprehensive Review

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ABSTRACT

Atopic dermatitis or eczema is a chronic inflammatory skin disease caused by several factors, including environmental allergens, family history of atopy, barrier dysfunction, and immune dysregulation. Eczema has been widely recognized worldwide for its adverse clinical and psychological effects. Besides affecting the physical appearances of the patients, the bad perceptions of the surrounding people, including friends, families, and strangers, toward the patients can worsen their mental health status and their quality of life. The burden of eczema has long been recognized as a socioeconomic and psychosocial burden worldwide, thus initiating some approaches towards improving awareness and better treatment that can lead to significant improvement in the quality of life of eczema patients worldwide. Two of the Global Burden of Disease (GBD) studies, International Study of Asthma and Allergies in Childhood (ISAAC) and other eczema skin studies are included in this review to study the global burden of this skin disease using the Disability-Adjusted Life Years (DALY) to assess the overall burden of the disease and estimating the prevalence of eczema worldwide. Regardless of eczema's direct or indirect cost, those effects have significantly changed the patients' lives negatively; thus, it is an issue that needs to be addressed globally.

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Introduction

Atopic dermatitis (AD) is a chronic inflammatory skin disease characterized by severe pruritus. AD is associated with external allergens and a family history of atopy (Silverberg et al., 2017a; Tham et al., 2019). Moreover, skin barrier dysfunction and exposure of sensitive skin to allergens can contribute to the severity of AD (Czarnowicki et al., 2017). AD usually begins in childhood, within the first 5 years of life, and the disease progression will be lowered after decades of presence in adults (Silverberg et al., 2017a).

Quality of life (QoL) is defined as a subjective measure of happiness associated with several preferences, such as financial security, job satisfaction, family life, health, and safety (Kagan, 2022). Health-related QoL (HRQOL) can be defined as a term related to the QoL in health aspects, generally considered to reflect the disease impact and disability, daily functioning treatment, and the perceived health impact on an individual's ability to live a fulfilling life (Saketkoo et al., 2021).

The term psychosocial is defined as the influence of social factors on an individual's mind or behaviour or to the interrelation between behavioural and social factors. It is also known as the interrelation of the mind and society in human development. The psychosocial impact can be either positive or negative towards the individual. Regarding AD, it concerns with the elevation of negative psychosocial impacts in the society and normally overlooked by the physicians in charge of the patients (Haraldstad et al., 2019).

Similarly, the severity of AD is associated with the socioeconomic burden of the parents or the AD patients themselves. The more severe the AD, the higher the financial resources needed to cover the treatment expenses. For instance, treatments using specialised routine skincare with strict regimens needs to be implemented, or else the AD symptoms could worsen (Wisuthsarewong et al., 2017).

Atopic Dermatitis as a Global Problem

AD is the most common chronic inflammatory disease that has affected up to a fifth of the population in developed countries. AD can be characterized by chronic, relapsing and highly pruritic dermatitis and has a characteristic age-dependent distribution (Vujnović & Domuz, 2017). Progression of atopic disorders from AD in infants to allergic rhinitis and asthma in children, adolescents and adults is describe as atopic march and may persists with increasing age (Porcaro et al., 2018).

Recent studies have revealed that AD is becoming more severe in terms of its prevalence and economic and psychosocial impacts on society worldwide (Kramer et al., 2017). It is known that AD affects approximately 20% of children and 3% of adults, and its prevalence is still increasing, particularly in low-income countries (Vaikili et al., 2019). Therefore, several studies have been conducted to study the impacts of AD globally.

The flexible design of GBD allows researchers to update the data and epidemiological studies regularly; thus, the tools are made available to be used globally, nationally, and locally to gradually understand the health trend further (Safiri et al., 2019). Two studies have used the data from GBD studies from 1990 to 2017 to analyse and understand the global burden of AD (Laughter et al., 2020; Al-Hemoud et al., 2018). DALY is used to assess the overall burden of diseases by using time-based measurement with combinations of years of life lost (YLLs) due to premature mortality and time lived in states of poor health and years of healthy life lost due to disability (YLD) (Laughter et al., 2020).

A study that reported the AD burden using prevalence rates and DALYs found that AD was deemed responsible for 0.36% of the total DALYs out of 359 diseases and injuries analysed by the GBD 2017. Moreover, among all of the other skin diseases (psoriasis, urticaria, scabies, and fungal skin diseases), AD represented the highest age-standardised DALYs in 2017. Both global DALY rates and global age-standardised prevalence rates remained stable from 1990 to 2017 (Al-Hemoud et al., 2018). Table 1 and Table 2 show the highest and lowest prevalence rate for the AD around the whole world.

A multinational, cross-sectional study was conducted in 2016 involving various countries with different prevalence rates of AD among the population of 18–65 years old. The prevalence rates for AD among adults were found to be 19,986 for the United State (US), Canada (10,004), France (9,964), Germany (9,971), Italy (9,897), Spain (9,924), UK (10,001) and 10,911 for Japan (Laughter et al., 2020).

In terms of measurement of the DALY, the higher rate of DALY indicates a higher rate of years lost due to the illness, disability, or premature death within the given population. For instance, DALY can be represented as a numerical value, such as one DALY equals one year lost due to the illness, disability, or premature death (Barbarot et al., 2018). Moreover, one DALY could also mean a one-year loss of healthy life, thus leading to the disease burden calculation by combining the mortality and morbidity, which allows comparison between different diseases (Dierick et al., 2020).

Table 1: Ten countries with the highest prevalence rate of AD per 100,000 (IHME, 2021)

No	Countries	Prevalence Rate per 100,000
1	Japan	5324.33
2	France	5087.17
3	Estonia	4786.64
4	Mongolia	4697.35
5	Uzbekistan	4680.62
6	Turkmenistan	4654.14
7	Georgia	4611.62
8	Italy	4276.3
9	United Kingdom (UK)	4250.15
10	Norway	4165.78

Table 2: Ten countries with the lowest prevalence rate of AD per 100,000 (IHME, 2021)

No	Countries	Prevalence Rate per 100,000
1	Rwanda	678.22
2	Egypt	853.93
3	Ghana	874.39
4	Kenya	914.12
5	Zambia	1036.29
6	Zimbabwe	1083.39
7	Togo	1099.44
8	Mali	1178.88
9	Qatar	1284.80
10	Saudi Arabia	1321.70

A study stated that the implementation of the ISAAC is among the best estimates of AD prevalence internationally due to the availability of the global map of AD, which allows for easy comparison of AD prevalence estimates between countries (Silverberg, 2017b). The ISAAC Phase Three study was conducted from 2001–2003 involving 234 collaborating centres, 98 countries, and 1,187496 children. Based on the ISAAC Phase Three study, an average of 60% of children within the age range of 6–7 years and 50.4% of children within the age range of 13–14 years had symptoms of eczema from 9 different countries with Northern and Eastern Europe having the highest percentage for both age group (66.7% and 58%) (Mallol et al., 2013).

Thereby, based on the studies conducted through the use of ISAAC and GBD, AD has already caught the whole world's attention as its prevalence can be seen in most countries. Even though the surveys or studies have revealed AD as a burden as early as 2000, the present data still showed that AD is still overlooked as a serious skin disease that badly affects individuals with AD in society and the professionals from the medical field.

Psychosocial Impacts of AD

The psychosocial impact is the impact of a disease or other factors on a person's mental health. It correlates with the QoL as negative psychosocial impacts cause a reduction in QoL. Some of the thoughts of males and females with AD, divided into six categories, including advice, suggestions, ways to cope with the disease, and their expression of dissatisfaction towards the people around them were recorded in previous studies (Birdi et al., 2020; Ghio et al., 2020; Bilyj, 2019). Their thoughts were recorded based on interviews from different studies, and some of them were posted on the websites as a guideline for the AD communities to assist them in managing AD.

AD Stigma

Physical disfigurement, psychological destruction, and social stigma often happened to patients with skin diseases (Zhang et al., 2019). Loneliness, social isolation, depressive symptoms, and decreased QoL were often associated with patients with skin diseases (Yew et al., 2020). In this case, those patients could have sufferred from psychosocial maladaptations of the skin diseases (Zhang et al., 2019).

Patients' maladaptive assumptions regarding their appearances and society's focus on the perfect body are some of the psychosocial impacts of skin disease (Zhang et al., 2019). In short, most of the AD individuals in those studies were trying to express the underestimation of AD based on society's thoughts on skin disease. Those thoughts lead to a conclusion of insufficient knowledge of the society towards AD.

Despite having negative thoughts and society's perceptions towards AD individuals, little is known about the differences in each person's understanding of the stigma between countries or societies (Topp et al., 2019). Likewise, the QoL of the AD patients were severely affected, with 85% of adults experienced interrupted sleep, 70% of them reported having social anxiety, 65% avoided exercise and sports, 52% avoided social activities and sexual intimacy, and 43% of them were depressed because of AD (Murray et al., 2020).

A meta-analysis and systematic review found that AD patients tend to have a significantly greater risk of developing suicidal thoughts and attempts than those without AD. (Sandhu et al., 2019). Based on the EuroQoL-Visual Analog Scale (EQ-VAS) (an indication of the patient to describe their overall health), AD adults had lower HRQoL than adults without AD. Furthermore, AD patients have a high-stress level, and the risk of suicide, depression and stress were approximately 1.7 times more prevalent in AD patients than those without AD (Kwak & Kim, 2017).

In terms of percentage, another finding reported a higher possibility of developing suicidal ideation in almost 44% of AD patients and a higher possibility (36%) of attempting suicide in AD patients than those patients without AD (Sandhu et al., 2019). More comprehensive efforts need to be implemented to reduce the social stigma experienced by those affected by the skin disease while promoting positive societal attitudes towards society concerning the diversity in appearances (Rumsey, 2018).

AD in Families

In the US, 7% AD adults had gone through divorced or separation. As proposed in the same study, separation and divorce could happen because of the negative life impacts of AD and comorbidities on social function and relationships (Hua & Silverberg, 2018). Data from a study indicated that separated or divorced individuals and unmarried individuals showed a higher prevalence of AD compared with the married AD individuals (Lee et al., 2017). Among 43.9% of mothers with AD who were raising their children alone, 18.3% were divorced, and 25.6% were widowed, which showed higher percentages of AD in these groups (Young & Keung, 2018).

Findings of a study found an increased AD prevalence with the possibility of increased severity was because of the stressors at home or neighbourhood (McKenzie & Silverberg, 2018). For both adults and children, stress is considered a very common trigger for AD. There are connections between stress and AD, resulting in an undesirable vicious cycle in which stress affecting the skin and AD symptoms which result in worsening the conditions (Bennington-Castro, 2019).

Maternal depression may lead to the development of atopic diseases, such as AD. For instance, the association between depression and AD can be observed in a study conducted among Korean children that showed a strong correlation between those two factors. The study found that the divorced mothers were significantly associated with maternal depression, eventually leading to the development of AD (Kim et al., 2018).

Mothers with maternal depressive symptoms due to lack of social support will eventually lead to low maternal sensitivity, resulting in a higher risk of their children developing AD (Letourneau et al., 2017). Additionally, a higher risk of childhood eczema in infancy can be observed among mothers with persistent prenatal depression. This event was likely due to maternal depressive symptoms at either early or late pregnancy (Wei et al., 2020).

Additionally, studies from Korea (Cho et al., 2010; Kanda et al., 2019) and UK (Kemmett & Tidman, 1991; Gratton et al., 2022) reported that 61% or 52% of female AD patients which experienced pregnancy had noticed AD deterioration. This is because of the effects from extremely high concentrations of estradiol and progesterone towards the Th2 activity and skin barrier (Kanda et al., 2019). During pregnancy, high level of estrogen caused the immune system's focus shifting from protecting the cells in the mother's body towards the fetus. Hence, causing the mother's body to be more susceptible towards AD (Gardner, 2022).

The impacts of AD children on their parents may cause their parents' QoL to be reduced significantly. Almost 43% of the parents out of 93 parents were reported to have moderate QoL, 23.66% of parents were affected severely, while the rest of them were affected at a low and normal level (Al-Hayyan et al., 2020). Furthermore, there was a possibility of the association between secondary depression or suicide ideation and sleep disturbances in mothers of AD children (Young & Keung, 2018).

Healthcare Professionals (HCP) and AD Patients' Relationship

Most of the time, AD patients seek treatments from healthcare professionals. Even though the physicians have suggested a few treatment options and regimens to the AD patients, the AD patients tend to not adhere to the treatment, resulting in a higher risk of unsuccessful treatments (Writers, 2017). This can be due to the patient-HCP relationship and the non-adherence can be avoided by increasing the regularity of appointments (Patel et al., 2017).

Nevertheless, the physicians might overlook the lack of information given to the patients. For instance, the physicians often do not address or quickly dismiss any discussion regarding complementary and alternative medicine (CAM). Therefore, a two-way discussion needs to be carried out between the doctor and the patient to signify that the patients' opinions are accepted in a good manner (Leow et al., 2018).

Most of the patients, who pay visits to the clinics, demand more information regarding their illness. In case of AD, the patients require more detailed information regarding the severity classes of the AD based on the symptoms. However, in-depth knowledge of the AD needs to be tailored as more knowledge received by patients results in generating unnecessary worry and could lead to negative impact (Leow et al., 2018).

Guidance comprised of several steps to provide supportive conversations between the healthcare professionals and the patients has been established. In summary, the steps in the guidance are to assess how AD affects the person's life, discuss the methods to manage the patient's AD on a daily basis, and maintain consistent control of their condition (Sanofi, 2019). Therefore, effective methods in AD treatment need to be developed and implemented towards AD patients to improve the patient-physician relationship.

Advantages of Having Reliable Platforms

Some of the advice were taken from the personal experiences of those affected by AD and posted at the National Eczema Association, which acts as the knowledge provider primarily for the eczema community. Adolescents and young adults require sufficient information regarding AD as they could not find any suitable information for their age. Luckily, those people from the same age groups were into blogging, and were able to help them in managing AD (Bilyj, 2019). Those experiences finally led to the first step towards better management of the AD.

Through online mediums, the virtual networking sites can help the AD patients in terms of facilitating online support communities and several platforms for them to interact with the medical professionals or experienced individuals in AD. Additionally, these sites serve as emerging platforms for the scientific journals to reach broader audiences and develop potential educational tools to assist them in coping better with their AD-related problems (Diaz et al., 2020).

Socioeconomic Burden

The services provided by the HCP, such as medical visits, days of hospital stay, emergency department visits, diagnostic and therapeutic requests, are considered as direct costs. Additionally, the transportation required for the appointment and the need for caregivers are parts of the direct cost (Murota & Katayama, 2018). Meanwhile, indirect costs include absenteeism, presenteeism, loss of employment, and social and psychological burden (Chung & Simpson, 2018).

AD patients need to plan their expenditures on a daily basis, due to the frequent application of moisturisers and other therapeutic products to control the AD symptoms and preventing its exacerbation (Adamson, 2017). By referring to the treatment outline, the treatment for AD starts with non-pharmacological treatment (education, emollient, avoidance of triggers, and quick baths with fragrance-free cleansers) and is followed by pharmacological treatment using the topical corticosteroids, phosphodiesterase-4 inhibitors, dupilumab, phototherapy, and immunosuppressants (Johnson et al., 2019).

Direct costs

A study conducted in Singapore stated that the AD infants and children with high impact on their HRQoL covered the most direct cost compared to those with moderate and low impacts, based on the average of total healthcare costs (Table 3). The HRQoL of the infants (<4 years old) were measured by the Infant's Dermatitis QoL Index (IDQOL), while the Children's Dermatology Life Quality Index (CDLQI) was used for the children (>4 years old) (Olsson et al., 2019). The infants and children with high impacts on the HRQoL and categorized in severe AD were accounted for 12.5% (64 out of 513), thus indicating the contribution of mild and moderate AD to higher impacts on the HRQoL. Thus, children in this category contributed significantly higher healthcare costs than the children with low impacts, regardless of the AD severity (Olsson et al., 2019).

Another study in Singapore which focused more on the severity of AD found that the overall annual total cost was 7,943 USD per child, summing up the total cost of healthcare service utilisation, informal care, and out-of-pocket (OOP) expenses. The findings of the study revealed that informal care (46% of the total cost) came out as the highest total cost compared with the remaining costs (37% and 17%) (Table 3) (Olsson et al., 2020). Advanced treatments for AD, including dupilumab, systemic corticosteroids (SCS), systemic immunosuppressants (SIS), and phototherapy, were investigated and SCS was the most common advanced treatment followed by dupilumab, phototherapy, and SIS (Eichenfield et al., 2020). Data revealed a significant burden to the healthcare system with an annual cost of approximately more than 20,00 USD per patient. Although dupilumab showed the highest total cost compared to other treatments, the clinical efficiency of dupilumab might reduce the medical-related costs for dupilumab (Table 3) (Eichenfiled et al., 2020).

A study from Spain reported that the cost of the treatment on average for AD adults was 1,604.74 USD, with notable differences with the severe AD adults, which cost around 3,932.89 USD, four-fold higher than mild forms (865.32 USD). Around 75.5% of the total cost came from healthcare costs (Table 3), mostly contributed by both the drug prescription and specialist care, while the remaining 24.5% from the loss of productivity (Sicras-Mainar et al., 2019).

According to the Dermatitis Family Impact Questionnaire (DFIQ), the impact of the 75 childrens' AD towards their families was investigated and the result showed that the family expenditure of the AD children had the highest impact, including cost of treatment and clothes, on the main caregiver's life and housework (Siafaka et al., 2020).

A study in Ireland has recorded that most adults and parents spent up to 53.35 USD/year, and 10% of the respondents spent more than 213.40 USD/year on the alternative therapies for AD. One-quarter of those groups have spent up to 2,454.05 USD annually for the direct cost expenditures. Unfortunately, 52% of them cannot always afford the AD treatment, and 58% of the parents admitted that they have to cut some of their household spendings to afford their children's treatment (Murray et al., 2020).

A comparison of healthcare utilisations between controlled AD patients and uncontrolled AD patients in the Netherlands showed that the later groups used significantly more healthcare resources. The direct cost for uncontrolled AD in each category is higher than the controlled AD in which the healthcare resources accounted the highest (Table 3). Consequently, the mean total direct cost of uncontrolled AD was 7,461.39 USD per patient per year, while it was 4,695.78 USD for controlled AD (Ariens et al., 2019).

Out of 10,533 individuals with AD in the US, the annual direct medical costs were 11,660 USD per patient. Since AD is generally treated on an outpatient basis, the outpatient visits cost the highest, followed by prescription, ambulatory, inpatient, and emergency department costs. The study also found that more severe AD has higher direct costs for all categories included in this study than the less severe AD (Eckert et al., 2019). The OOP cost for both medical and non-medical consumptions that were not covered by health insurance differed based on the severity of AD in a study conducted in France. The approximate OOP costs for mild AD were 285.63 USD, 441.30 USD for moderate AD, and 753.07 USD for severe AD (Drucker et al., 2017). Additionally, this study stated the importance of social inequalities in the AD treatmtent as some of the patient treatments were covered by insurance (21.1%), while it was not the same case to other AD patients, and it further leads to a reduction in adherence to the treatment because of their incapabilities to continue with the cost of the treatments (Drucker et al., 2017).

A study that investigated the OOP costs for nine European countries (Czech Republic, Denmark, France, Germany, Italy, Netherlands, Spain, Sweden, and the UK) have found that besides 989.22 USD was spent per year on healthcare, the mean extra spending per month was 82.43 USD with emollients and moisturisers accounted for the highest monthly cost (Table 3) (Launois et al., 2019). All things considered, the direct cost of AD has been a huge burden not only towards the AD patients but also their parents. Hence, indicate the need of thorough understanding of this skin disease financially and support from the government itself towards the importance of aiding these families for them to adhere to the treatment and resolving their financial issues.

Table 3: Mean cost of different measurements of direct cost of Atopic Dermatitis

No	Categories	Cost (Mean)		References
1.	High Impact HRQoL	3,787 USD		Olsson et al., 2019
	Moderate impact HRQoL	2,548 USD		
	Low impact HRQoL	2,258 USD		
2.	Dupilumab (ACMC- 3620 USD + ACPC- 32,885 USD)	36,505 USD		Eichenfield et al., 2020
	SCS (ACMC- 12,066 USD + AC PC- 5858 USD)	17,924 USD		
	SIS (ACMC- 12,536 USD + A 12227 USD)	13,763 USD		
	Phototherapy (MC- 14,944 USD + PC- 2606 USD)	17,550 USD		
3.	Severe AD	14,335 USD		Olsson et al., 2020
	Moderate AD	7,935 USD		
	Mild AD	6,651 USD		
	Informal care	3659.1 USD		
	Out-of-pocket expenses	2934.6 USD		
	Healthcare service utilizations	1348.9 USD		
4.	Primary care	754.35 USD		Sicras-Mainar et al., 2018
	Specialist care	1575.93 USD		
	Total medication	2799.76 USD		
5.	OTC Treatments	<26.67 USD - >16 USD		Murray et al., 2020
	Prescription treatments	<26.67 USD - >160.05 USD		
	Alternative treatments	<26.67 USD - >160.05 USD		
	Doctor's fees	<26.67 USD - >160.05 USD		
6.		Controlled:	Uncontrolled:	Ariens et al., 2019
	Healthcare Resources	4695.78 USD	7461.39 USD	
	Medication	1630.35 USD	3569.05 USD	
	Diagnostic Tests	9.60 USD	11.74 USD	
	Laboratory Tests	264.61 USD	294.49 USD	
	Transportation and Parking	97.10 USD	124.84 USD	
7.		More severe:	Less severe:	Drucker et al., 2017
	Inpatient costs	3,063 USD	1,849.9 USD	
	Emergency department cost	765 USD	425 USD	
	Ambulatory cost	3,234 USD	2,041 USD	
	Outpatient cost	4,568 USD	3,029 USD	
	Prescription cost	3,492 USD	2,321 USD	
8.	Emollients	808.77 USD		Launois et al., 2019
	Hygiene products	710.61 USD		
	Solar protection	413.99 USD		
	Dressing and Bandages	300.89 USD		
	Clothes	186.72 USD		
	Dietary supplements	201.66 USD		
9.	Emollients and Moisturisers	29.46 USD		Zink et al., 2018
	Medications	18.93 USD		
	Doctors and Hospitals	9.26 USD		
	Bandages	7.60 USD		
	Travel expenses	6.07 USD		
	In-patient treatment	2.07 USD		

Indirect costs

Indirect cost can be defined as the productivity loss that affects the cost of the outcome of the productivity loss. From a societal perspective, a person is productive if this person is useful to the society for the work and goods produced by that person, the person involvement in unpaid activities, such as volunteer works, non-profit organisation, or even household duties. (Zink et al., 2018)

In indirect cost, there are two terms involved; presenteeism and absenteeism. Presenteeism can be defined by two definitions. The first definition is when the employee feels like it is better to stay at home rather than going to work (Fautrel et al., 2020). The other definition is when the staff is staying at work past the working hours or come to work earlier regularly; thus, they are working longer than within their contracted working hours (Fautrel et al., 2020). The definition of absenteeism is the frequent absence of employees from his or her work. Absenteeism is associated with habitual absence, excluding both authorised leaves and paid time off. In other words, absenteeism is any failure to report for or remain at work as scheduled, regardless of the reason (Price, 2021).

Presenteeism and absenteeism caused a much higher indirect cost towards the AD patients based on the European Union-5 (EU5) (Figure 1). The indirect cost for the EU5 countries (France, Germany, Italy, Spain, and the UK) based on the Dermatology Life Quality Index (DLQI) severity band are available in Figure 1 (Girolomoni et al, 2021). The study found a correlation between AD severity and work productivity loss; with more severe the AD, the higher the number of days lost at work. Moreover, the increasing severity of psychosocial comorbidities (sleep difficulties, anxiety, and depression) was associated with poorer HRQoL and work productivity loss. Thus, this study suggested that those comorbidities mainly affect the HRQoL and the indirect cost burden rather than the direct cost (Girolomoni et al, 2021).

From that Japan National Health and Wellness Survey (NHWS), the overall-work-impairment (OWI) in employed AD patients (30.61%) was rather higher than the employed non-AD controls (24.62%) (Arima et al., 2018). Furthermore, the severity of AD also affects the AD patients as more severe AD conditions lead to a higher rate of presenteeism (32.17% vs 26.10%), OWI (33.79% vs 28.08%), and activity impairment (35.14% vs 30.06%) (Arima et al., 2018).

An estimation of the productivity loss has been made and represented in OWI, as shown in Figure 1. The combination of direct medical cost, self-medication cost, OWI, and AI costs resulted in the nationwide disease burden in Japan, which was estimated to be 3036.9 billion Japanese Yen with a majority of the nationwide burden dominated by the OWI cost (69.7%) (Arima et al., 2018). In another study, 57% of AD patients had absenteeism for at least a day out of 5 days, 26% for at least 1 week (6–10 days), and 13% were absent from work for more than 11 days (Zink et al., 2018).

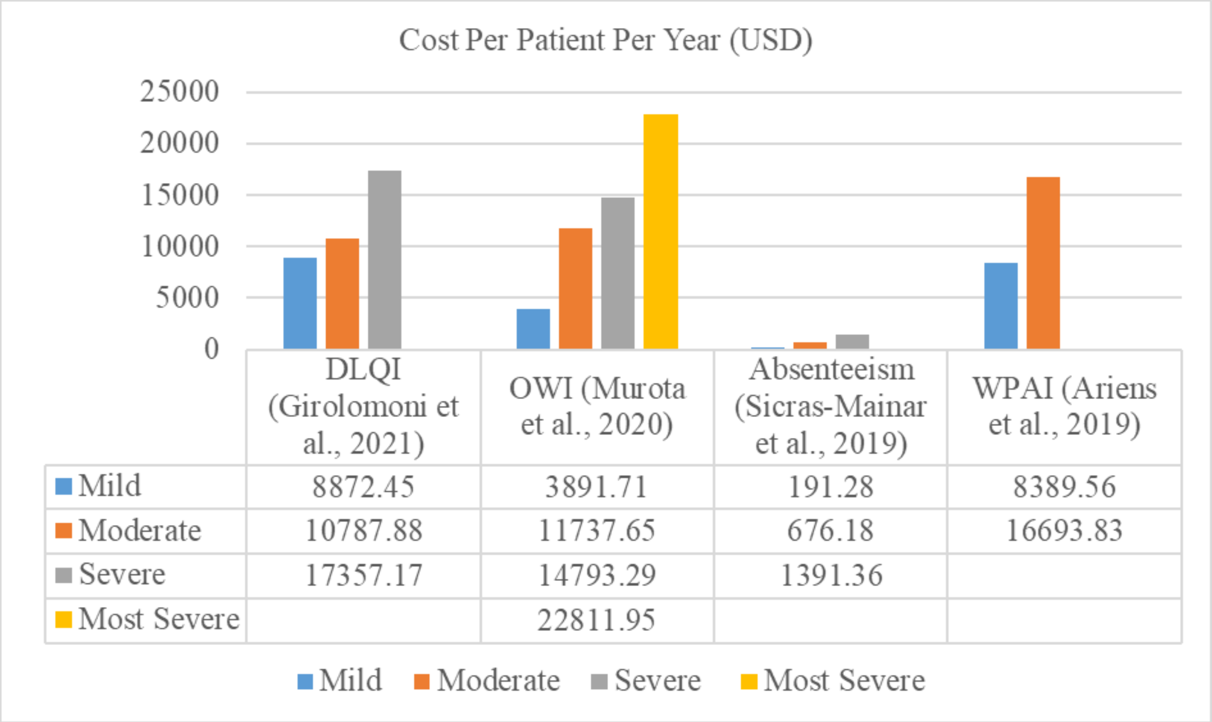
In Spain, the impairment of work productivity has risen the expenditure for AD patients. Approximately 1,989.71 USD has been accounted for mild to severe AD due to the impact of the productivity loss plus an amount of 108.62 USD was the cost they lose for a day when they were not working (Sicras-Mainar et al., 2019). Based on Figure 1, the more severe the AD, the higher the cost per day the patients will lose (Sicras-Mainar et al., 2019).

Around 10,774.93 USD per patient per year was the productivity loss for the AD patients in the Netherlands between January 2016 and September 2017 (Eckert et al., 2019). The work productivity and activity impairment (WPAI) of both controlled and uncontrolled AD were calculated based on OWI and activity impairment (Figure 1). The cost of productivity loss was higher than the total direct costs associated with the AD patients, which concludes that its impact on them was much bigger due to the impairment at work and daily activities associated with AD (Eckert et al., 2019).

The differences between employed subjects with AD and without AD showed a much higher rate of absenteeism (9.9% vs 3.6%), presenteeism (21.1% vs 16.1%), and OWI (25.6% vs 18.3%). Moreover, the annual indirect cost, taking into account the absenteeism, presenteeism, and OWI, was 2,400 USD higher for AD subjects than non-AD subjects (8,907 USD vs 6,517 USD). Regarding the impairment of the daily activities in all AD subjects, the mean percentage of AD subjects was much higher than non-AD subjects (33.6% vs 25.2%) (Murota et al., 2020).

The socioeconomic burden of AD in Denmark was associated with the increased use of social benefits, including paid sick leave and disability pensions which contemplate the negative impact on the work-life of AD adults and the financial burden of society. Paid sick leave was more prevalent in older populations for both mild/moderate and severe AD (Slagor et al., 2020). Both mild/moderate and severe AD for the younger groups had a more long-lasting and prevalent paid sick leave than the controls. Whereas only severe AD patients had more long-lasting and prevalent paid sick leave for the older groups (Slagor et al., 2020).

Taking everything into acccount, the negative impact of AD towards the indirect cost result in a huge loss towards the AD patients. Even though there were some countries that offer paid sick leave and diasbility pensions, it does not reflect any positivity in terms of productivity for these patients. The most important thing for them is to improve their HRQoL in their employment aspect and to work without any worries of troubling the surrounding community.



	DLQI (Girolomoni et al., 2021)	OWI (Murota et al., 2020)	Absenteeism (Sicras-Mainar et al., 2019)	WPAI (Ariens et al., 2019)
■ Mild	8872.45	3891.71	191.28	8389.56
■ Moderate	10787.88	11737.65	676.18	16693.83
■ Severe	17357.17	14793.29	1391.36	
■ Most Severe		22811.95		

Figure 1: The cost per patient per year based on the severity of AD

Conclusion

In conclusion, it is best to consider AD as one of the skin diseases that required the attention of healthcare professionals and the society around them. AD cannot be underestimated as a normal skin disease as it can significantly affect the patient physically and mentally. The psychosocial impact and the economic burden of AD have brought a lot of attention from researchers around the world to solve the problems associated with AD as it affects the QoL of the patient. Further research studies in the burden of AD need to be conducted especially in regard to the number of participants or patients involved in the study and clinical identification or diagnoses of AD need to be proven by the healthcare professionals as a prove that the participants are truly affected by AD to strengthen the study's data. Better insights can be created for AD patients by spreading the knowledge to society and educating the whole world that equality is important in every aspect of life.

Conflict of Interest

The authors report there are no competing interests to declare.

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