Psychological aspects of type 1 diabetes

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PSYCHOLOGICAL ASPECTS OF TYPE 1 DIABETES

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List of Abbreviations

IDDM – Insulin dependent diabetes mellitus

DM – Diabetes Mellitus

HbA1c – Glycosylated hemoglobin

DM – Diabetes Mellitus

SMBG – self monitoring blood glucose

CBT – Cognitive Behavioral Treatment

QOL – Quality of Life

List of Contents:

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Abstract

Diabetes mellitus type 1, or Insulin-Dependent Diabetes Mellitus (IDDM), is a chronic autoimmune disease caused by the absolute lack of insulin hormone in the body. The essential function of Insulin hormone is to keep the body's glucose metabolism and homeostasis. The pathophysiology behind IDDM is an unregulated attack of the β-pancreatic cells by the immune cells of the own body. Consequently, the result is irreversible damage to the insulin-producing cells, β-pancreatic cells. Therefore, for IDDM patients, the main problem is keeping glucose homeostasis. In the long run, IDDM patients may suffer from complications in different body systems such as vascular, renal and, neurologic.

IDDM disease most commonly diagnosed around the ages of childhood to adolescence. In the course of this period, kids and teenagers are dealing with constant mental and physical changes such as identity formation, building self-ego and friendship circles, hormonal changes, etc. (1) Furthermore, this years-period is full with challenges and dynamic psychological stressors which, help building the personality and internal view of the self. In the same manner, each individual is built from a complex of coping mechanisms and personality characters, making each one's strategy of behavior towered stresses different. Diagnosis and management of IDDM add load and stress even more, which according to researches affecting glycemic control.

The thesis will describe the psychological aspects concerning IDDM patients. Furthermore, the thesis will subordinate these psychological factors as protective or risk factors for DM1, based on a variety of researches data. By the end of the thesis, it will be clear to understand that the needs and, treatment approach may be different if it is child, adolescent or, adult (2).

Overall, there is still not enough data about the emotional management and, the different approaches to use while dealing with a chronic disease. Nevertheless, there are more and more data being discovered, which assists physicians to understand how to yield with their patients the best, or at least a better, outcome.

Important to add that the thesis based on researches later than the year 2000 since the treatment has changed dramatically.

PSIHOLOŠKI ASPEKTI ŠEĆERNE BOLESTI TIP 1

Sažetak

Šećerna bolest tipa 1 je kronična autoimuna bolest karakterizirana deficitom inzulina. Glava uloga inzulina je održavanje metabolizma i homeostaze glukoze u tijelu. Patofiziološki, kod šećerne bolesti tipa 1 dolazi do ireverzibilnog, imunološki posredovanog, oštećenja beta stanica gušterače koje su odgovorne za sekreciju inzulina. Za bolesnike s tipom 1 šećerne bolesti najvažniji je problem održavanje homeostaze glukoze u tijelu. Bolesnici sa šećernom bolesti tipa 1 dugoročno zadobivaju komplikacije bolesti na različitim organima kao što su oštećenja krvnih žila, slabljenje bubrežne funkcije i bolest živčanog sustava.

Dijagnoza šećerne bolesti tipa 1 najčešće se postavlja u djetinjstvu i u adolescenciji. Taj je period života karakteriziran fizičkim i mentalnim promjenama koje se događaju u tijelu uz intenzivne promjene koje se odvijaju na socijalnom planu. To je vrlo dinamično razdoblje života u kojem su djeca i mladi izloženi različitim izazovima i vanjskim stresorima s kojima se nose pomoću različitih mehanizama obrane. Život s dijagnozom šećerne bolesti tipa 1 u tom periodu predstavlja dodatan izazov i stres.

U ovome radu sumirani su rezultati dosadašnjih istraživanja koja su se bavila analizom protektivnih odnosno rizičnih psiholoških faktora na uspješnost liječenja šećerne bolesti tipa 1. Rezultati dosadašnjih istraživanja ukazuju da je različita vrsta psihološkog suporta potrebna kod različitih dobnih skupina bolesnika koji boluju od šećerne bolesti tipa 1.

Sve je više istraživanja koja se bave zbrinjavanjem emocionalnih problema mladih bolesnika s kroničnim bolestima s ciljem poboljšanja regulacije osnovne bolesti. Međutim, to područje i dalje ostaje kao velik izazov kako za liječnika tako i za bolesnike i njihove obitelji.

Introduction

This thesis will present another, not less important, side of diabetes. As such, the thesis review the personal side, outside the doctor's office: the mind, thoughts, and feelings of a diabetic type 1 patient.

The thesis speaks only about type 1 Diabetes (not including type 2 DM), to emphasize the different time-period and challenges diabetics type 1 are faced with. It is critical to understand that, type 1 diabetics teenagers and children, are having **different** childhood and adolescent period compared to non-diabetic individuals in the same period. The risk of depression, anxiety and feeding behavior is only a small part of the whole story. It is important to understand the weight of these factors on decision making in diabetes management and life generally. That is to say, the psychological factors should be included when thinking about the diabetic treatment plan. Diabetes control and management are based on decision making; it depends on the food choices, physical activity, injection dosing and time. It is not only the type of insulin or special new glucose monitor device given but also, the patient's decisions when left alone. This is why, it is valuable to shape and help mentally these young patients, to understand **how to make the right decisions and**, **how to cope with future challenges and obstacles**.

At present, there is a progression and implantation of a patient-centered approach when dealing with the general population of patients. This approach is based on the theory that the emotional state (thought, beliefs) of the patient is a central part of the healing process. Also in diabetes, implantation of a patient-centered approach may show promising results.

Speaking of diabetes type 1 treatment, endocrinologists are searching to give the best and newest treatment to their diabetic patients, intending to reach the ideal glucose values. The outcome though, not dependent only on the treatment technologic or pharmacological tool. Based on studies presented in the thesis, also family function and social circles, personality, age and even gender of the patient are notable modifiers, risk or protective factors, of glucose control. To strengthen, even more, the importance of acknowledging the effect of the psychological aspect on diabetes, I would add that even I, as an IDDM patient, was surprised by how much I did not

know. Feelings that I felt but did not put too much thought about, were cardinal to my personality progression and the coping systems I use today.

“Why me?” Was one of the questions I found myself asking again and again, even till today. Surprisingly, during writing the thesis, I understood slowly, that all these moments I felt lost, insecure and angry were predictable and logical. The thesis sheds light on the aspects which are thought to be common sense, yet usually, are left out of the doctor's office and, the diabetic treatment regimen.

Factors influencing glycemic control

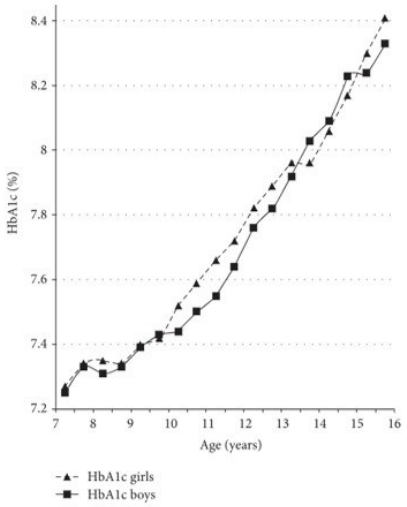
There are several psychological stressors referred to as risk factors, which can have an impact on glycemic control. By the same token, stressors can affect differently on different individuals. To make some order, we can divide these psychological stressors to uncontrollable and controllable stressors(3). To explain, uncontrollable psychological stressors will be factors that cannot be changed or modified. The only way to reach the target glucose levels is by not denying to these stressors, but to work through them or with them. To give an example, uncontrollable stressors are age, financial strain, and sex. On the other side, controllable stressors are stressors that can be altered or can be even deleted. For example peer and friends cycle, family conflict management, working conditions, etc. To reach an optimum lifestyle for a diabetic, we must try to optimize all these factors together.

Uncontrollable factors: the role of demographic characteristics in glycemic control

Differences in genders in terms of glycemic control

Type 1 DM is an exception when speaking about autoimmune diseases and female predominance(4). While most of the autoimmune disease associated with female predominance, IDDM affect equally male and female, with male predominance in Caucasians(5,6). Even though it is still in research, several papers are already showing the differences in glycemic control between the sexes, male-sex with better control. This can be explained due to the dissimilarity of hormonal, mental and physiological factors. Some of the researches even state that female sex is a poor predictor of glycemic control. According to Plamper et al. (4), which analyzed longitudinal data from a database including 1294 patients, data show a linear increase in HbA1c % with the increase of age in both sexes. Moreover, in comparison to the male sex, female sex has higher values of HbA1c (Figure 1.).

Figure 1: HbA1c measurements before and during puberty comparing female to male subjects. (4)

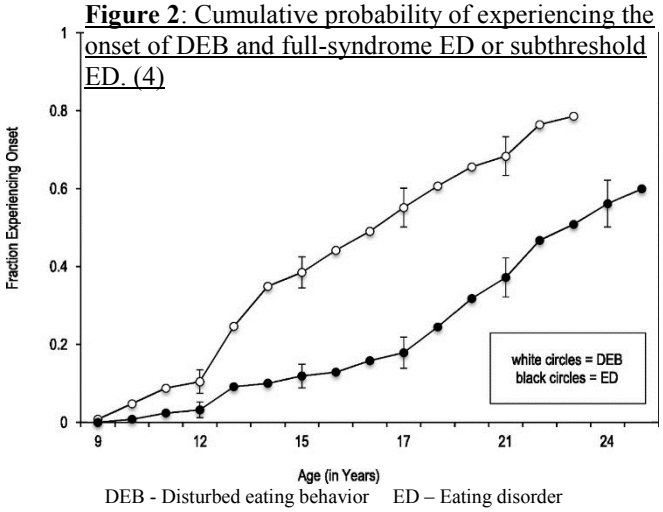


The higher HbA1c values in females can be explained by feeding behavior, personality characters, hormonal status, which will be elaborated below.

Feeding behavior

In the last two centuries, many studies were published, examining the relations between IDDM female patients and feeding behaviors. Generally, it has been shown that female IDDM patients are more likely to have some maladaptive feeding behavior, as part of being diabetic. For instance, Aria et al. (7) discovered that eating disorders were as twice as common in the IDDM female population than the non-diabetic population. Another example is a study done in 2002 following 143 diabetic patients (70 females, 73males). The study showed that: "*Unhealthy weight control practices were reported by **37.9% of the females** and by **15.9% of the males**... Correlations between disordered eating and HbA1c levels were significant among females (r = 0.33; P < 0.01) and males (r = 0.26; P < 0.05).*" (8). As a matter of fact, it is not only that there is female diabetic predominance associated with eating disorders (ED) but also, there is a correlation with HbA1C which are correspondingly worsening. In other words, the female gender is more prone to have worse HbA1C levels compared to male diabetics. Another study which emphasizes the association of ED and IDDM female patients is a cohort-prospective study, which followed more than 70 IDDM female patients for 14 years(9). The aim was to observe the incidence and prevalence of eating disorder (ED) and disturbed eating behavior (DEB) among type 1 DM females. DEB mentioned as an outcome, include purging, dieting, binging or fasting, whereas eating disorder is the onset of the full compulsive syndrome. Results based on the data collected and, supported by **figure 2**, showed that the probability to develop DEB or ED during the follow-up period was increasing with age, reaching 60%-70%. The reasons behind this result may be due to the maturation factor including increased awareness of body image, being exposed to more criticizing social cycles and media or, the sense of autonomy and experimenting decision making.

Figure 2: Cumulative probability of experiencing the onset of DEB and full-syndrome ED or subthreshold ED. (4)



DEB - Disturbed eating behavior ED – Eating disorder

Another point this cohort-study mention is that 27% of the participants, had some form of Diabulimia. Alejandra et al. (2011) stated that Diabulimia, a term used specifically for DM patients, stands for misusage of insulin, which includes restricting or omitting insulin use as a method of weight control(10). A meta-analysis done in 2018, also analyzed different aspects of Diabulimia. Based on different studies included in the meta-analysis, there are more results showing increase incidents of Diabulimia in females, compares to males(11). One of the reasons behind the restrictive use of insulin is, in fact, the trophic effects of insulin. Insulin increase lipogenesis and associated with weight gain and obesity(12). Not to mention other motives that can assist Diabulimia such as the fear of hypoglycemia episodes, embarrassment managing glucose in public, desire to have a break from diabetes and others(13). Consequently, lack of adherence to the treatment regimen leads to high values of blood glucose which, may lead to future complications.

Another interesting issue that is presented in the study is, a dilemma associated with the feeding behavior of IDDM patients. While there are many strategies for insulin dosing and feeding, some IDDM patients manage their diabetes by restricting their meals to the pre-determined meal and insulin dosing, not linking their meals with hunger or calorie body needs. This leads to a true dilemma - on one side, this feeding behavior is ideal for glycemic control. Yet, from the other side, it can lead to calorie deficit and may even lead to, a classic eating disorder (i.e. Bulimia Nervosa).

Given these points, Diabulimia, eating disorders and disturbed eating behaviors are easy traps for the IDDM female patients. Not to mention that these behaviors are not only affecting the mental status but, also are interfering with the management of glucose levels.

Personality characteristics:

"When she says "I feel like you are not even here," he says "What do you mean I'm not here? Of course I am here. Don't you see my body?" (John Gray, Men Are from Mars, Women Are from Venus).

There are numerous books describing the mental and emotional differences between the two sexes. In fact, many types of research study the manifestation of the female-male gap in

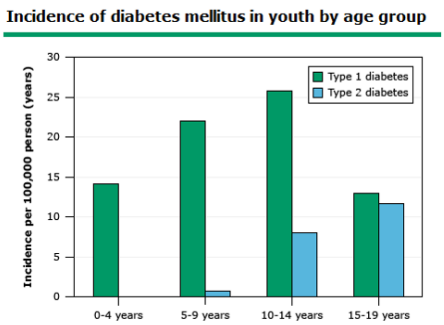
different aspects of life. It is also applicable when thinking about diabetes management. The process of making decisions regarding diabetes management can be very different between males and females. Specific coping characteristics which are more prevalent in the female population, such as: putting the need of others before the needs of themselves, self-harm and lower self-esteem(14) can modify how decision are made. Even the common opinion about the roles in relationships, helps women adopt these type of characters, as a mother and, as a wife.

Another difference between males and females is the way of perception and expectations. A research that was done in 2007, during the century of insulin pump development, observed the psychological aspects of insulin pump users. Detailed in the research are the female problems concerning with the pump. In comparison to males, females were more concerned about how to fit the pump with skirts and dresses. Also, females felt more aware of their body image (e.g. wearing the pump with bathing-suit). While males in the research were describing the pump as a pager, females described the pump as a "fashion challenge"(15). And yet, surprisingly not as expected, a big study (2019) including 96,547 Type 1 diabetics from Germany and Austria, showed that it was predominantly female adolescents and adults who are using insulin pumps compared to males(16). Important to note though, is the time frames both researches were done. It may be that today the designs have improved or, that there are more fashionable solutions to fit female needs. Either way, it is still interesting to see how males perceive the usage of a pump in comparison to how females perceive it.

Supported by many articles, it is now a known fact that IDDM females have more difficulty to reach ideal HbA1C levels compared to IDDM males. Though there are many supporting facts for this statement, some are still in debate, such as the hormonal state. Nevertheless, it is important to understand how to tackle the obstacles. If not for the physical state, at least for the mental well-being of the patients.

<u>The age range in relation to glucose management</u>

According to UpToDate data(17)(18), IDDM peak-diagnosis occurs in two age groups: 4-6 years old and, 10-14 years old (**figure 3.**). This specific age range consists



Incidence of type 1 and type 2 diabetes mellitus in youth in the United States, from the SEARCH for Diabetes in Youth Study Group, 2002-2003. For type 1 diabetes, there are two peaks in incidence, in mid-childhood and early puberty; this bimodal distribution is not evident from the age categories used for this figure.

Data from: Writing Group for the SEARCH for Diabetes in Youth Study Group, Dabelea D, Bell RA, et al. Incidence of diabetes in youth in the United States. JAMA 2007; 297:2716.

of many important physical and mental processes that can have an impact on decision making concerning diabetes.

Altering environment

The age ranges mentioned above are important transition points in a child's juvenile-life. To put it in another way, ages 4-6 years includes the movement from a kindergarten to primary school. As well, 10-14 years, which includes the movement from primary school to elementary school. Both transitions hold many changes and challenges for any child and teenager, such as a new social environment, new social rules, new expectations and fears, etc. Moreover, social-criticism and physical state comparisons between one another is common behavior during these ages. That said, these transitions are very important for adolescents to develop autonomy, social circle, ego and self- confidence. Ultimately, the changing structures of these, internal and external factors, may disrupt the psychological well-being balance and increase stress levels. Mentioning this gives good reasoning to the worsening of glycemic control during puberty (**figure 1.)**(19)**.** Speaking of a diabetic teenager, the concern is even more complexed. To explain, IDDM management includes chronic and dynamic (changed by stress, food, exercise) treatment. In detail, glucose control includes taking blood measurements plus, injections or insulin pump. The fact that the management is constant and variable daily, makes it hard for diabetics to conceal their disease if they wish to. Mentioning above the emotional storm adolescents going through, it is logical to understand why some patients prefer to be with high glucose values, then to manage their diabetes in front of people. It is this kind of decision making that leads to high HbA1C values and future complications**.**

Age risk factors

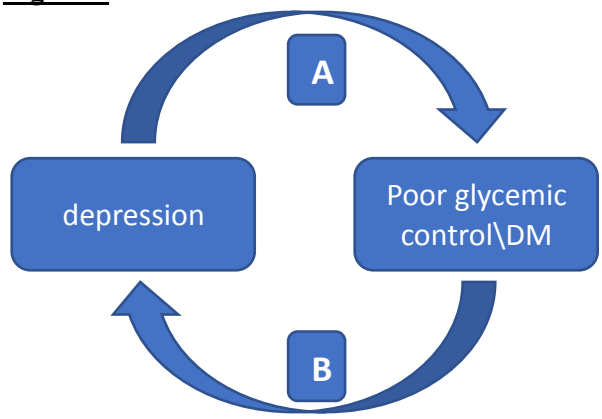
There are number of diseases with peak age-diagnosis during puberty. Among these, two diseases are in a matter of importance: diabetes and depression. Particularly, we can argue that there is cross-relations, or even to say cross-impact, between the two diseases. The last sentence not yet holds full consensus, but still, proved by many studies that will be provided by this subchapter.

As the main theory, there are bidirectional relations between diabetes management and depression (**figure 4**.). It may be claimed, that these relations are actually, creating a vicious cycle- when one of the conditions is worsened also, the same occurs to the other condition.

Meaning, worsening of diabetes can impose more stress on mental stability pushing to depression. Or, on the opposite side, worsening of depression may itself lead to deterioration of glycemic control.

To prove this bidirectional theory, many types of researches were done. From the researches published, most studies agreed about a higher risk of depression among the IDDM population (compared to the general population) (20,21), which is statistical, no cause-effect data. Saying this, the same studies did not succeed to reach consensus about the depression influence on glycemic control, if there is any(A) (22,23).

Figure 4



To justify arrow A, there are suggestions explaining how having depression can be associated with the worsening of metabolic control. For example depression, as a mental process, can manifest by apathy, lack of responsibility and, self-careless behavior(24). Behaviors as such, usually manifest by lack of hygiene, decrease appetite, insomnia, decreased concentration, etc. Based on these grounds, it would be more than likely that depressive patients would not comply with the demanding needs of the treatment method. Moreover, depression can lead to changes in the hormonal state by increasing cortisol levels. Cortisol hormone is a crucial hormone in the fight-or-flight response. One of the key functions of cortisol is insulin resistance and, increase glucose levels in blood. As a consequence, depression may play part in insulin resistance and increase difficulty reaching glucose control.

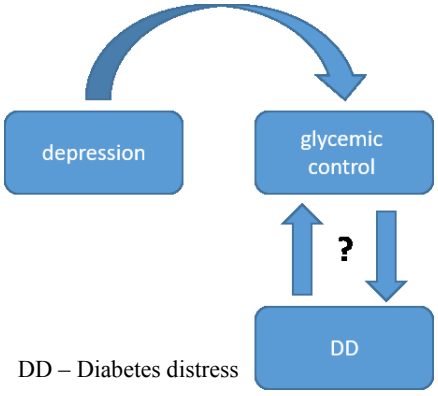
To justify arrow B, it is more complicated. IDDM is demanding, diet-wise as, medicine wise, leading to continuous stress and worry. To emphasize this, we can mention the patients who associate high glucose values to a subjective internal feeling of failure(25). Some patients relate the high glucose values to the constant fear of future complications. Other patients, especially adolescents, feels that the IDDM makes them different from their peers in situations like alcohol drinking, appearance and the ability to be spontaneous. It is even may include situations of trauma: the diagnosis moment, severe hypoglycemia or, wrong dosing with severe implications. The psychosocial stress is enormous even if subconsciously. The dealing with constant stress,

anger, feeling of injustice and, frustration, not only due to diabetes but also due to puberty stressors, makes depression a logical outcome(20).

Lastly, if we wish to reject the bidirectional theory, it is also possible. To reject arrow B, we can mention Reynolds et al. (21), meta-analysis research, which studied the difference between chronically ill and healthy children in different aspects. From the studies included in the meta-analysis, depression symptoms and state indeed were more common in IDDM children. But, all participants with depressive symptoms or depression, were in either good or bad glycemic control. That is to say, depression did not show any association with good or bad glycemic control. Hence stating, that glycemic control per se is no predictor of depression.

About arrow A, there is full controversy. While there are many types of research supporting the fact that there is an impact of depression on glycemic control, still some studies are inconclusive or rejecting it(26,27). One of the studies which rejected it(27), actually found an interesting new hypothesis. The study presented another new term called, Diabetes Emotional distress or, Diabetes Distress (DD), to include in the range of mood disorders. DD is a term for having negative emotions that are associated with living with diabetes, management and self-care. While, depression can be associated with different other reasons, besides diabetes. Both states may be manifested similarly, but they are not the same. The study aimed to find the relations between different mood states (depression, anxiety, DD) and HbA1c. What is interesting, is in fact, that DD was usually a term used in type 2 Diabetics, and for the first time was also linked to IDDM patients. Results of the study, as already been said before, rejected any association between depression and HbA1c. Yet, more importantly, is, that results did succeed to show a significant correlation between DD and HbA1c, presenting to us a new picture **(Figure 5)**. Specifically, as we see in the new picture, there is not yet full clearance about the type of relations between the two variables, glycemic control, and DD. This is due to the type of study, cross-sectional, which cannot show causative correlations. This, gives us only dry statistical data that need to be explored more deeply. Also, the study emphasizes that the two terms (DD and depression) can

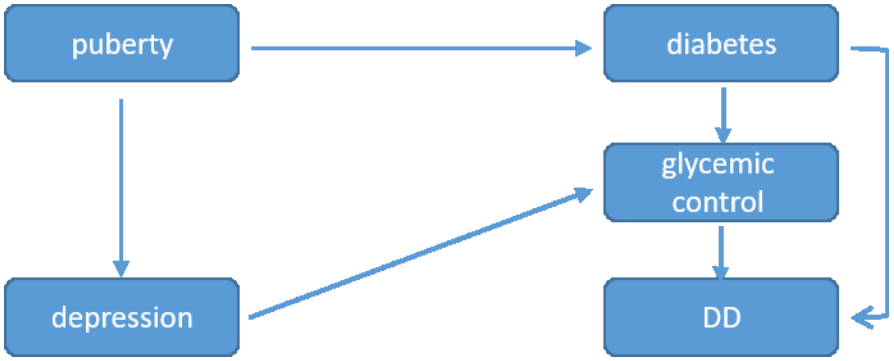
Figure 5: DD, depression and in relation to IDDM



not be proved completely to be different entities indeed, yet it is a matter of importance: by severity, treatment wise, and clinical appearance. That is to say, it is a new question that should be figured out.

Going back to the starting point, we can sum it up by saying that, age has a major importance when dealing with diabetic patients. Furthermore, we should understand better the variety of emotional disorders that can affect glycemic control. There is more research-work need to be done to understand and differentiate better these terms, with the main goal of giving a better quality of care. **(Figure 6)**.

Figure 6: Puberty, diabetes, depression, DD and glycemic control and their predicted associations.



DD – Diabetes distress

Personality characteristics and coping mechanisms of IDDM

As already understood, the effectiveness of diabetic treatment not only depends on the drug type and dosages but also, depends on the patient's character and behavior (i.e. decision-making ability). Describing the management of diabetes is like an "unfair tango". Meaning, it may be that the patient doing everything correctly and still, not reaching the diabetic goals. This is because every day might be different concerning to management. It may be that, there is increased resistance to insulin due to weather changes, stress, physical activity, hormonal change, infection or even mood. That is being the case, it is crucial to understand, that glycemic changes require behavioral adaptation on a day to day basis(28). Resilience, which will be described further, would be a protective factor concerning these adaptations.

Furthermore, it is now acknowledged, that glycemic control and management are affected by the type of character and set of coping mechanisms. In particular, studies that were exploring the emotional state of diabetic adolescents, succeed to show the type of character and coping mechanisms that predict the level of glycemic control (29).

Another key point to mention is, that personality and coping can be mentioned under non-controllable and/or controllable factors. In fact, even though we are genetically born with some built-in attitude and character, it is still possible to be modified by continuously practicing and actively focusing on a new mindset.

Types of Personality Traits – "Five-Factor Model"

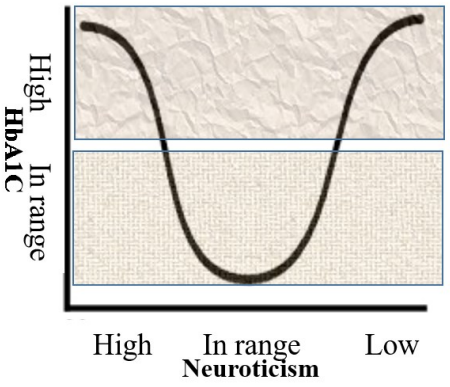
Personality traits can be described by different classifications. One of these classifications called "The Five-Factor Model" by McCrae and Costa. "The Five-Factor Model" is a theory that presents a taxonomy of five main personality traits. The first personality trait described in the theory is *conscientiousness*, which associates with achievement striving, self-discipline, and deliberation. A second personality trait described is *the openness to experience*; which describes the interests of different hobbies and tastes, active imagination and internal curiosity. A third personality trait is *extraversion* refers to social interest, outgoing, talkative and energetic personality. The fourth personality trait is *agreeableness* or *compliance*; described as the will to cooperate, forgiving attitude, having a reputation as a pushover. *Neuroticism* is the fifth personality trait, defined as low self-esteem, a tendency to depression and, a pessimistic perception of life and associated with low emotional control(30).

These five personality traits were actually, studied by research done in Sydney(31). The research aimed to study the association between these personality traits and diabetic patients' decision making (i.e. glycemic control). The study included 158 patients (aged 8-19 years). Data was collected by personality record done by questionnaires, structured interviews three times a year for 3 consecutive years plus, collection of glycemic control record by obtaining the memory of blood glucose meter of the previous 2 weeks before each office visit and, HbA1c values. From the statistical data, researchers used different statistical tools to measure if there is an association between personality traits and glycemic control, which manifests by self-monitoring blood glucose per fortnight (SMBG) and, HbA1c. The results showed many interesting findings. First,

data showed that the two main personality traits which correlate positively with good glycemic control are conscientiousness and agreeableness. While, the lack of these personality traits associated with poor glycemic control. Also, Hierarchical regressions and Forced-entry regressions integrated revealed that age and conscientiousness are independent predictors of SMBG. Accordingly, people who scored high in conscientiousness consistently had a higher number of SMBG. Moreover, younger participants (8-13 years old), also had a higher number of SMBG then the older participants (13-19 years old). Important to note is that the total HbA1c values collected, among the whole group, were stable during the 3 years of research. Yet, more specifically, individuals with high or low conscientiousness and agreeableness had different dynamics of glycemic control; Meaning, groups with low conscientiousness and agreeableness had deterioration of HbA1C levels over the 3-years research; while groups with high conscientiousness and agreeableness had stable HbA1c values during the 3 years. One of the explanations for these results may be that conscientiousness is associated with health-protective behavior such as healthy food selection, non-smoking, and exercise(32). Regarding neuroticism influence on glycemic control, there is a curvilinear relationship; the high and low levels of emotional regulation are associated with higher HbA1c levels. This, can be explained by the Yerkes-Dodsun law(33) which describes the relationship between mental arousal and performance as a bell-shaped curve (Figure 7.).

The aim of mentioning this article is to present the importance of the emotional part of each patient and, its association with the success of treatment. More specifically, one must note that even though each individual is comprised of a set of specific personality traits, they are not fixed and can be modified during a lifetime (mostly until age 30). Accordingly, there can be more consideration and attention to personality traits when dealing with the disease. For example, IDDM patients with low conscientiousness can be engaged in practicing self-organization and

Figure 7: Neuroticism effect on HbA1C level



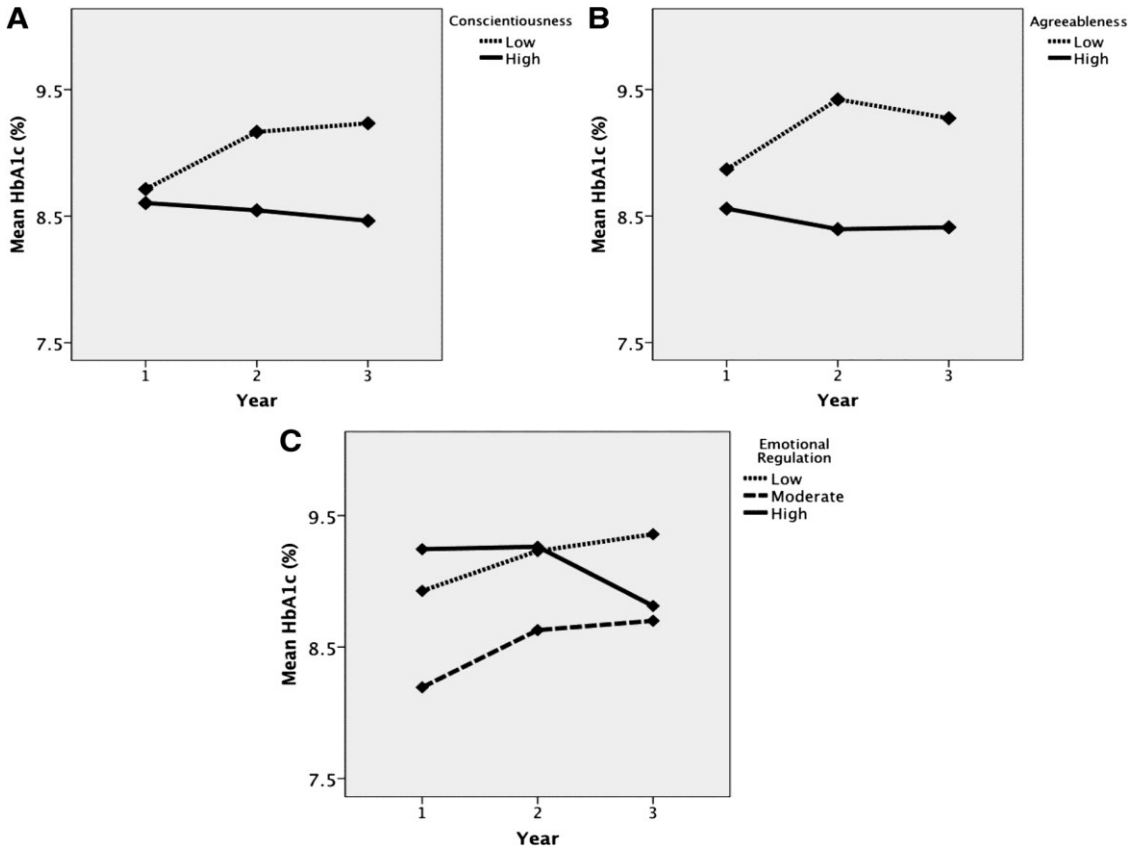


Figure 8: Mean HbA1c levels during the 3-year study period, stratified by personality domains. A: Conscientiousness. B: Agreeableness. C: Emotional regulation.

behavior awareness which can indirectly help in managing diabetes better. Another example is, helping patients with low emotional regulation by finding strategies to deal with anxiety and stress. Combining medical treatment with psychological methods may (supported by researches) enhance and ease the complexity of glycemic control.

Types of Coping mechanisms

There are different models to classify coping mechanisms. One of the more recognized, formal classification, is of Lazarus and Folkman which divides the coping mechanisms to problem-focused and, emotion-focused coping mechanisms. With the progression of more knowledge and researches being published, there has been some modification of the coping model. Nowadays, the updated coping model being used, called coping-control, which divides coping styles into three different groups: primary control coping, secondary control coping and, disengagement coping(1). There are many more models published and used, most laying on the same base of

idea – active or passive coping. The first thing to remember is that coping mechanisms are used frequently in situations of stress and, with the diabetic population, coping may have an effect on glycemic control and quality of life.

Lazarus and Folkman (1984)

Coping defined as *"constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person"* (Lazarus & Folkman, 1984(34)). More precisely, Lazarus and Folkman divided the coping mechanisms into two types: *problem-focused* (active control) and *emotion-focused* (avoidant control). Problem-focused, means to actively handle the problem; trying to find a solution to solve it. Referring to diabetes, for example: maintain a strict diet, exercise, monitor more times a day blood glucose levels, administer insulin with more care and thought, etc. Emotion-focused coping can be described as, dealing with the emotional state surrounding the problem, instead of dealing with the problem itself. For example self-blaming, frustration, avoiding, denying and wishful thinking.

A study done in 2010, followed 109 diabetic type 1 adolescents for four years. One of the aims of the study, was to examine the cross-effect of coping mechanisms on glycemic control. Looking at the results, a significant correlation was found between the level of emotional reactivity, which manifests similarly to emotional-focused coping, and HbA1c. Moreover, results also showed inverse-correlation between problem-focused coping and HbA1c levels(35). The results also note that the data showing correlations on glycemic control was not differed by gender. Leading to the assumption that, coping factors affects HbA1c levels independently of social and hormonal status. Problem-focused coping association may be logical, but it is the emotional-focused which is more complexed. Both copings are mentally-consuming copings methods. Yet, while one is more focusing on self by looking at the current and past, the other is more active to care for the future. It may have another interpretation by mindset, which is a dynamic skill, it can change by time and situations. It is based on the internal feeling of self-confidence to believe in own ability to reach own goals by making changes and adaptations (i.e. problem-focused coping). The feelings of anger, dispute, avoidance leading to a different mindset which associate with low self-confidence and less motivation to make the appropriate changes and adaptations.

We can mention another study(1), which reviews a variety of coping skills and their effect on IDDM patient's glycemic control. The study presents similar results like the previous study, showing that there is an impact of coping style being used, if it is a problem or emotional-focused coping. Also mentioned in this study, was the avoidance coping style, which is similar to emotion-focused control, but holds more passive neglecting behavior. Interestingly, results showed that avoidant coping is more used by adolescents compared to children, and associated with poorer glycemic control. This is to remind figure 1., where is shown the worsening of HbA1c levels during adolescence, as it may be in fact, associated.

Control-coping

Another manner of classifying coping strategies is called "control-coping". The idea behind this division based on the keyword - control. Meaning, to control best in different situations in life, we must use different coping styles accordingly. Control-coping styles are divided into primary control, secondary control and relinquished control. Primary-control coping (i.e. problem-solving, emotional modulation) relates to actively modify the environment to be fitted to self-needs. Secondary-control coping (i.e. positive thinking, cognitive restructuring, acceptance, distraction) is adapting self to environmental constraints. Plus, relinquished control (i.e. disengagement coping) means to focus energy on negative emotions towered the stressor itself, similar to emotion-focused coping(36). To demonstrate the control coping methods, Jaser SS et al. 2011(37) examined the productivity of these three control-coping strategies on glycemic control. The study, questionnaire-based, studied 30 IDDM adolescents (10-16 years old) patients, plus HbA1c measurements as a determinant of glycemic control. The method of the study included questionnaires including questions related to disease-associated stress and, the behavioral response which was chosen to cope with these stressors. According to the study results, primary and secondary control strategies were associated with better glycemic control and better diabetes-quality of life. Whereas, disengagement control strategy linked to poor metabolic control. Nonetheless, the most chosen stress response was a secondary control strategy (28-32% of stress responses), followed by a primary control strategy (13-28%).

Furthermore, it was six years later, when Jaser et al. 2017(29) aimed even more specifically. The study searched the ideal fit of control coping with the appropriate stressors. To appreciate the

importance of the study it is essential to know that diabetic patients deal with many different stressors each day; feeling different from their peers, self-guilt when glucose values are high, nagging and criticism by parents and constant awareness and limitations due to glycemic hypoglycemia or hyperglycemia. Hence, different control approaches manage the situations differently, some with better success while some with less success. Not as expected, study results revealed that during diabetic-related stress, most subjects chose the disengagement control strategy compared to the other approaches. Joining the two studies, Jaser 2011 and 2017, we can assume that, high-level stressors can compromise the ability to select effectively between the control mechanisms. Accordingly, the results of Jaser 2017 did show that high diabetic stressor managed by disengagement coping mechanism has lead to poor glycemic control. Furthermore, Jeser study 2017 did not succeed to show the link between primary and secondary control strategies and good glycemic control, unlike the previous study in 2011. On the contrary, the results did not show any association between the control strategies and glycemic control. The probable reason can be, that all the patients who participated in the study were in good glycemic control during the study, leaving not enough variability in glucose values to test the relations.

In conclusion, coping styles are a cardinal component in decision making. Moreover, the correct use of coping styles can have an impact on the quality of life and quality of care. It is important to understand which coping styles are better with diabetic patients. And, even more important, which coping styles are actually used in stressful times, and why. After all data are analyzed, more research should be done on the productivity and effectiveness of these treatments, to understand which types of interventions are best for each patient. It is important to understand that until now, it is not an absolute part of treatment. Sadly, it still common to see diabetic kids and adolescents who handle fears, stress, anxiety, and pressure without knowing how to use the right tools.

Resilience as an important factor in diabetes outcomes

Resilience has many definitions and can be calculated by different scales, factors or questionnaire types. Every researcher can choose freely between the measurement methods for resilience since there is no absolute definition. Resilience is used frequently in studies on DM1, due to the common factor – stress. While IDDM may increase stress levels, resilience is

frequently a protective factor. Studies may subdivide resilience to be more situation-specific. A couple of examples will be discussed in this chapter.

Emotional resilience

Resilience can be defined as, mental processes and behaviors, by way of self-protection from the potential negative influence of stressors(38,39). According to Dr. Steven Southwick, resilience is not a general trait, or part of a character, which constant to all life aspects. To emphasize, a person can be resilient in the workplace or academic setting, while can still have difficulties dealing with stress in the personal family life(40). Understanding the importance of resilience in stressful situations, resilience is a very good variable to test on IDDM patients. Indeed, many studies were done, with conflicting results referring to resilience and effect on diabetes control.

One study, that was done by Yi-Frazier et al. (41), followed 50 IDDM patients. The study measured resilience by performing interviews and also, collected HbA1c levels as a measure of glycemic control. The interviews done, were to answer the criteria of "resilience factor", consist of total score of self-esteem, optimism, and self-efficacy. Interestingly, looking at the data, results show no association between resilience level and glycemic control (Table 1.). To clarify, the lowest HbA1c was with moderate resilience, while a higher mean HbA1c was with high resilience. Nevertheless, results did fit expectations in one part; worse glycemic control was seen with the lowest resilience. To say it differently, it is the least resilience that was significant for diabetes control in this specific research; still presenting valuable information about the importance of resilience. Another interesting note in this research is, that participants with high resilience, scored also high in using problem-solving coping strategies. For a reminder, problem-solving coping was mentioned in the

Table 1. Variable- and person-focused analyses of the association of resilience with distress and diabetes outcome

Variable	M ± SD	Correlation with RF	Resilience groups			ANOVA
			Low	Moderate	High	F
Diabetes-related distress	23.70 ± 17.22	−0.36*	30.96 ± 18.10	22.51 ± 14.69	17.57 ± 16.78	2.82^
A1C	8.53 ± 1.62	−0.15	9.21 ± 2.17	7.82 ± 0.87	8.54 ± 1.28	3.29*
Diabetes QOL	68.87 ± 12.55	0.50***	63.08 ± 10.33	68.31 ± 12.37	75.19 ± 12.40	4.56*
General QOL	82.33 ± 12.29	0.60***	75.70 ± 12.23	80.91 ± 11.85	90.30 ± 8.04	7.90**

Means (*M*), standard deviations (SDs), and correlation coefficients for the resilience factor (RF) with key variables, overall and stratified by resilience group. ANOVA: analysis of variance; AIC: glycated hemoglobin; QOL: quality of life

previous chapter, as a good predictor of glycemic control. Accordingly, we may assume that high resilience associated indirectly with better glycemic control then, being with low resilience.

Health resilience

Another approach to define resilience called, "health resilience". In the generalized young population, "health resilience" is defined as the **psychological positive outcome** despite exposure to stressors or risk factors. While in younger diabetics, "health resilience" or "diabetic resilience" is a **health physical outcome** (i.e. glycemic control, complications, family cycle distress), with diabetes handling, as the stressor(42).

Hilliard et al. (2012) explain this clinical theory model of diabetic resilience, intending to help young diabetics to handle better health-resilience(43). The main idea is, that there are three processes in health-resilience: risk factors, assets, and outcome. First, Hilliard presents two main elements of health-resilience: adversity and protection. As such, adversity referred to as, the exposure to a variety of risk factors (lower socioeconomic status, diabetes burnout, family conflict, etc.). While the other element is protection, which referred to as the assets, coping or tools, which leads to positive outcomes, like humor, positivity, determination, and intelligence.

Second, Hilliard also displays the classification for outcomes of diabetes resilience as two groups: behavioral (or "diabetes-competence") and, health resilience (or "diabetes health outcomes"). To explain, the health-resilience group is set by clinical and laboratory physical indicators of glycemic control (Hba1c levels, blood glucose levels, and DKA-associated hospitalizations). In like manner, there is the behavioral group, which associated with management strategy and motivation, for example, glucose monitoring and correct insulin dosing and administration. So easier would be to associate behavioral outcomes with bettering practically and, health resilience with clinical improvement.

A research done in 2017(44) tested the relations between the main components of Hilliard module. The study followed 471 DM1 adolescents, with collecting data about types of different risk factors (adversity) and strengths (protection). Health resilience in this study includes "diabetes competence" and "diabetes health outcomes", which is explained above. Final Results show that higher strengths were associated with better resilience outcomes. Moreover, one persistent association was between strengths such as self-efficacy and family support, which had a positive effect on health-resilience outcomes (clinical status). Equally important, was the

negative influence of risk factors like anxiety and family conflict on health-resilience. As shown above, patients who scored high in resilience are more resilient to depression and anxiety. Additionally, patients with the highest resilience scores found better HbA1c values. By all means, resilience has a generalized effect on the quality of life and glucose control. It may be associated with the base it lies on, including strengths like coping, attitude, ability to adapt, etc. The main point to mention is that according to data, resilience can be mentioned as a protective factor concerning IDDM patients and can be one of the treatment targets.

To conclude, resilience consists of subjects, or factors, which were mentioned before such as various risk factors, coping mechanisms and, outcomes like glycemic targets and/or better glucose control practice. Due to the triangle relations, it is a great target for treatment. Treatment can include targeting risk factors or protection (i.e. strengths), which supported by studies, can help with ameliorating outcomes.

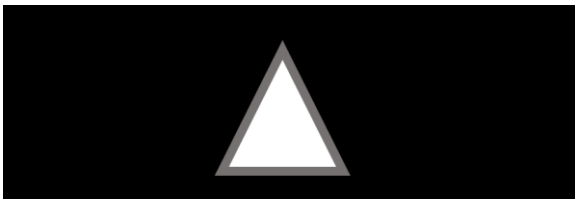


Figure 9: Health-Resilience Main Components

Controllable factors: the impact of the social environment on the diabetic patient

IDDM, as already said before, mostly diagnosed at the ages of puberty. During puberty, communicative cycles such as family, social, school, work and even romantic relations becoming apparent in life. When speaking of diabetic adolescent, a point often overlooked is, that diabetes and diabetes management does not only affect patient solely. The side effects and complications are important issues concerning all caring society for that person, between them mainly family, close friends, and partner. Accordingly, good interpersonal relationships are an important factor speaking of a better quality of life, diabetes – care, self-confidence, coping mechanisms and, most importantly, glycemic control.

Familial support

The moment when a child or adolescent is diagnosed with diabetes is a shared one. Meaning, shared with the caregivers, such as parents. By the same token, health concerns are also shared between family members and patient, due to the age of diagnosis and the type of responsibility

(familial and personal). Obligations such as appropriate diet, treatment by injections and measurements, exercise and control tests, are all crucial to fulfill the best chance for glycemic control. With this in mind, important to mention is that responsibility for glycemic control is dynamic over the puberty period. This to say, in most cases, parenteral responsibility for patients' glycemic control is inverse, to the age of the patient. While the patient is young, the responsibility of diabetes-care is mainly on the parenteral side. As the patient matures, responsibility is expected to move towered the patient's side. It is important to realize that negative feelings of managing diabetes, are frequently shared between patient and caregivers, and may even be shared equally. In fact, it may be that parents are so involved that they may feel like "having" diabetes themselves. The on-going engagement with a chronic disease like diabetes can lead to mental wear, inter-personal tension, and triggers for arguments. The end-result includes more stress, anxiety, and frustration surrounding the familial unit. Farther-on, leading to less concentration, lack of motivation and, less energy to invest in the management of diabetes from both sides. Leading to the key point - the level of the functioning family unit may have some role in diabetes management.

A meta-analysis done in 2013 by Tsiouli et al. (45), examined the question about the family circle and its power on glycemic control. The meta-analysis included 10 different studies that were analyzed. Looking at the results, it was shown that a functioning family was proven to be a good predictor for glycemic control. Functional family in a broad term that can be explained by "*a place where people feel like they can grow together as individuals within the family environment. There are* ***love and unity, but also individuality*** *among the family members… People take time for each other and offer support and guidance to each other... They* ***teach their children and set a good example for them to follow****."* (46) To say in other words, providing the child with less criticism, more support, more confidence and, safety feeling associates with better ability of the child/patient to manage his/her difficulties. Another result of the study described the power of different styles of parenting on glycemic control. For example, authoritarian parenting style (more demands less responsiveness) associated with less adherence to treatment and poor glycemic control. While on the contrary, the authoritative (demanding and responsiveness) parenting style associated with a better glycemic control outcome. For instance, demanding from a child is a way to make the child feel respected, expected, responsible and cared for. In the same manner, responsiveness is also very important, giving the child a feeling of

safety, support and, feeling of importance. The combination of the two makes a functional family, with better communication, relations, and resilience.

Another study, Margaret et al. (47), a randomized control trial, examined the glycemic outcome in response to an improvement in a family function. The method of the study was to give parents and their school-age (8-12 years old) patients, sessions of CBT for 12 months. Medical records of patients were also collected, and then the final data was analyzed. The theory was, that a functioning family is linked with more stability and less anxiety, with end-result of better glycemic control, as seen in the previous study. However, not as expected, there was a continuous small increase in levels of HbA1c during the year of intervention, but still, Hba1c levels were patterned under the upper limit. To explain this unexpected result, we must remember that the study was done on teenagers going through puberty, which associated frequently with a steady increase of HbA1c levels.

Looking from a different point of view, even though the result did not show a positive outcome, the research showed that with intervention, parents were less involved in the management of treatment which, gave them more energy to be responsive to the emotional child needs. That is to say that, improving family functioning may not improve glycemic control directly. Yet, not less important, good family functioning with emotional responsiveness, may help in decrease levels of anxiety and negative feelings, which is indirectly associated with better glucose control and higher QOL (Quality of Life). Therefore, indirectly, a good family function may have a positive influence on glycemic control, even if sub-clinically.

Another study done in 2011, examined the idea of providing support to the caregiver and the patient's family, looking for any change in outcome concerning patients' glucose control(48). The study measured four different aspects: support of the IDDM patient from the family, support of the IDDM patient from friends, support of the caregiver from another adult and support of the family from the health care system. The study was intentionally limited to the African American population and/or low-income families (associated with worse glucose management). Results of the study showed that in families, which caregivers were provided with support by another adult or health care system, glucose management values of the IDDM patient were better, than families without support. One explanation may be the fact that, when a caregiver was supported emotionally and mentally by another individual outside of the family circle, it may be, that the

caregiver had more emotional and mental capability to support his own child. Sharing thoughts and concerns with someone can broaden perspectives and give more ideas to deal with upcoming challenges. Also, the action of searching for comfort and share concerns may be an active action of "cleaning the mind" from negative feelings, leaving more space for positive emotions like optimism and motivation. It is logical, that a positive environment is better for one's mental health than a negative one. Indeed, the research succeeded to show the association between family well-being and positivity and, glycemic management. In conclusion, the study showed that a supported parent leads to a better supportive parent. Which by the results of the study leads to better glycemic control of the supported child.

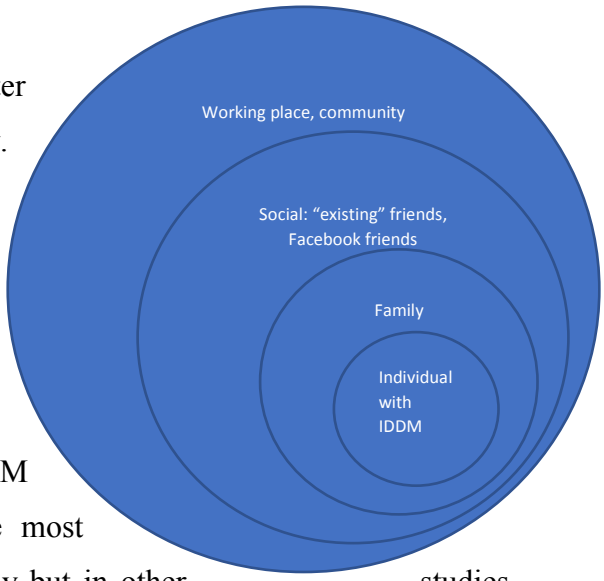
The importance of the family unit is not a new idea. This is supported by synonyms like roots, brotherhood or, home. Proven by different researches, a family is an essential part of guiding and motivating. This is also not different when speaking of diabetic patients. It is not a protective factor absolutely in all cases, but it is very likely to be a risk factor when the family unit is not functioning.

Social support

Nowadays, with the rising popularity of social media, the social circle has broadened from living "existing" friends to more Facebook or Instagram followers. Mentioning Followers, may include unmet personalities, unspoken but seen before people and also, friends in life. These two types of friends ("Facebook-friend" and "reality-friend") can have a different influence on a diabetic patient. Probably a diabetic child would be more exposed to the "reality-friends" while the diabetic adolescent or adult would be more exposed to the "Facebook-friends" community. Either way, the social circle has some influence when speaking about patient and glucose management. To elaborate, a social circle can share medical information as a piece of advice or, act as a supportive community to emotional needs and breakdowns. The service social circle can give, is mostly beneficial, even though not always. It should be used by the patient carefully, as we will see further on.

"Reality-friends" and peers

Figure 10: Interaction circles



Spreading outward from the family circle is the circle of friends (figure 10). In other words, a newly diagnose IDDM patient will, probably, encounter friends after being cared for by family. Correspondingly, the choices that the newly diagnosed diabetic patient will make, can be enormously affected by the type and quality of friends they are surrounded by. To emphasize this idea, a meta-analysis based on 18 articles, gives a couple of important examples of social issues IDDM children are dealing with daily(49). Defiantly, the most common issue which comes up not only in this study but in other studies too(50,51), is the unwillingness to be different. One study (2007) which supports this statement, is a study that examined friendship influence on glycemic control(52). Opposite than it was expected, as the support from friends had increased so was the deterioration of glycemic control. While the basic assumption was wrong, it still can have many reasons why the association is logical. Close friendships can have many benefits, yet sometimes good intentions can do more harm than good. In the study, a repeating bothersome concept was the attention and care of close friends to diabetes as a limiting factor. For example: not offering snacks, stop what they are doing until the IDDM child is finished with glucose monitoring or injection, etc.(49) The over-caution around diabetes may cause the IDDM child to feel different, leading to an internal build-up of stress and even, depression. Finally, ending with the indirect result of glucose management deterioration. Furthermore, it was pointed out, that in some cases these experiences have led some IDDM patients not to share their diabetes disease with other new friends.

For this reason, it is important to understand the type of relations around IDDM kids, specifically which are benefiting while which are not. Moreover, it may be beneficial to encourage the diabetic young population to share their expectation and needs, with the surrounding close relationships. Another similar, but different, meta-analysis was done in 2012(53), analyzing 24

articles from the years 1990-2010, with the question of peers' influence over IDDM adolescents. Surprisingly, opposing the expected hypothesis, the meta-analysis results showed, for the most part, no influence of peers over glycemic control. The result can have a variety of explanations. First, all studies, except for one, did not succeed to differentiate between peers and friends. In other words, for the purpose of studies, these two terms were the same, which in reality is not the case. In reality, peers are random individuals sharing the same age or school, while friends are chosen by self for a more intimate stronger relationship. Under these circumstances, it may be true that peer power is indeed not measurable. The second example which can distort the study results is the fact that none of age, sex or family environment were variables in the studies. These three mentioned variables are important predictors of glucose control and management as shown in the previous chapters. Lack of reference to the three variables in the studies which the meta-analysis is based on, may falsify the end results. Altogether, it is not quite clear if peers or friends have any influence on blood glucose levels and management, or not. The problem with these studies may be due to the methods being tested, the level of honesty and seriousness in answering these questioners, different biases and variables which are sometimes uncontrollable, etc. Nevertheless, the most constant statement which was repeating in different researches was that social pressure is affecting the psychological state of the patient. Consequently, leading to less capacity or interest in taking care of the self.

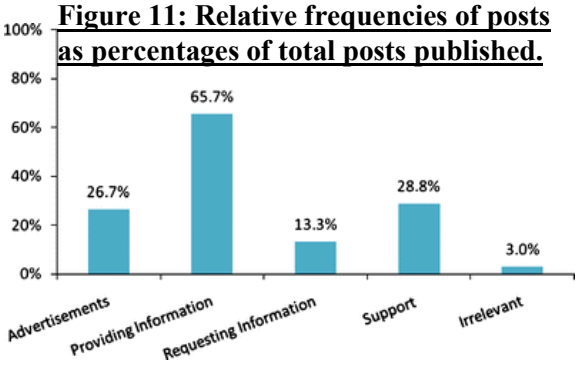
Web social support

The Internet as a global network, has an important part in interpersonal communication, information resources, and services. Speaking of the internet regarding health and medicine, it is even gained its name “Dr. Google”. In the same fashion, the internet’s other utilities include health blogs, YouTube health-promoting videos, treatment reviews, etc.

Over the last decade, the internet has gained a new function which is a platform for support groups. The online social support group is usually used by older adolescents and adults and can include not only the patients, but also the caregivers, partners, and specialists. The functions it fulfills are important and variable. For example, providing information about treatment methods, reviews of new treatments and/or help in emergencies by sharing an experience or even sharing medications. A study that was done in 2010(54), identified 15 large support groups on

Facebook. Looking inside these support groups, the researchers searched for data that will describe how users use the the relatively new platform, and what it's purpose. Results show that each group has 1000 to 60,000 participants, on average 9000 per group. The groups can be international or for a national community. The most common published posts are shown in figure 11. Important to mention is that today most of these supporting groups restrict advertisement activity. Therefore, currently, the main discussions are about providing or asking for information and support. Another study which was done in 2001(55), followed for 21 months after 47,365 users who visited three big internet discussion groups about diabetes (type 1 and 2). Also here, the intention was to understand the way of the use of this new platform. Data showed that most of the users were from the US and mostly above the age of 30 years. Only 7.55% were active by posting massages while the other 92.45% were passive readers. Also in this study (like in the previous study mentioned in this chapter), they reported the percentage of the highest popular topics among the published massages. The "hot topics" were nutrition (48%), the emotional impact of diabetes (18%), managing high or low blood glucose levels (10%) and complications (8%). From those who responded to the satisfaction survey, 78% of the responders agreed that this platform is assisting them with coping with diabetes. Although the fact that the study may be considered remote (2001), it is still relevant nowadays. Furthermore, important to note that 20% of the responders were not diabetic at all. Still, it may be, that their interest in knowing what their relatives are going through may be for the benefit of all. Plus, even though, they are not the ones who suffer from diabetes, it does not mean they do not need to cope with the frustration of their loved ones.

Figure 11: Relative frequencies of posts as percentages of total posts published.



The advantages of these groups are multiple. First, individuals can stay anonymous and still be part of the group. Second, it is not only for IDDM patients but also for their supporting caregivers. Third, reading other people everyday experience and difficulties shows the individual he is not alone, and more importantly, that he is part of a group which can support each other and gives ideas how to go through the common challenges. Due to the fact it is a new platform, and it is on a virtual space, it still hard to measure reliably its long term effects on glucose management and control.

If I may add my own experience, I would say it tremendously changed the way I feel about having diabetes. The share of thoughts and ideas on how to handle the obstacles of diabetes recharges you with energy to keep on going and trying to work best on your health. When I am having a bad day with blood sugar levels, it is comforting to see that I am not alone, because almost every day there is another person in the world (in the international group) who shares his feelings about the same bad day that he has.

Partner support

The adolescence period is a time to test and try different aspects of sexuality and romance. Most adolescents reaching adulthood, have already some experience or interest in these fields. It is a normal phase of maturation, based on hormonal changes and brain development. Sexuality does not have to include romantic relationships, but for this topic, we will speak about partners in a close romantic relationship. Generally speaking, partners may affect enormously on each other. With this in mind, working relationships are a matter of compromises and patience between any two individuals. Speaking of relationships including IDDM patients, it is important to notice relationships can be divided into diabetic-diabetic romantic relations or, diabetic- non-diabetic relations. Both types of relationships may differ from each other. In the diabetic-nondiabetic relationship, the attention and needs may be unequal. Moreover, differently from type 2 diabetics, usually the non-diabetic partner is young and in good health, so the attention health-wise is frequently directed to one side in the relationship. In diabetic-diabetic relationships, there is a similarity between medical needs and attention. Therefore, we can assume that diabetic-diabetic relations have some benefits. First, giving the fact both sides are sharing the experience with the disease, they can help and direct each other how to improve in managing glucose. Second, understanding and support are truly genuine from facing the same stressors and obstacles. To compare this to a diabetic-nondiabetic relationship, the inequality and variability in responsibilities (on each side) can cause many reasons for disagreements, disappointments, frustration (on both sides) and anxiety. Interestingly, there are no many studies about the challenges of diabetic-diabetic relationships and/or diabetic-nondiabetic relationships. Although IDDM is mostly diagnosed at young ages, most of IDDM patients are actually adults. Hence, putting pressure in making more researches about this subject, may expose us to another important factor influencing diabetes management. A study that was done in 2017(56), examined the diabetic-nondiabetic relationships and, the degree of involvement of the non-diabetic partner

in diabetes management. While not measuring the effect on glycemic control, still the study pointed out some significant points. IDDM individuals mostly agreed that partner is most helpful when provides emotional support or instrumental support (measuring glucose, calculating carbs), and when helping in hypoglycemic episodes. On the opposite, most of the IDDM patients agreed that the partner is unhelpful when distress or worry about diabetes. The last part may be explained by what was mention before, the uncomfortable feeling of being different, "special" or unequal. Also, the worrying act, makes the diabetic feel underestimated as an adult who cannot take care of its own. The term "sick" or "have a disease" are terms that may be associated with weakness, vulnerability, needy or, helplessness. All these associations are mostly unwanted by no one. It may be that from these reasons being worried towered diabetics is not helpful. Talking again about the study, the study does not correlate the data with glycemic control. At the same time, it is not less important to recognize good and bad communal coping mechanisms. Better yet, it would be beneficial to understand how to work, live and communicate with IDDM patients, about their soft spots (i.e. diabetes and management) without increasing tension. With collecting knowledge, it may be possible to understand how to increase the feeling of well-being on both sides, leading to relationships with less anxiety and frustration.

Looking from a different angle, a study that was done in 2014, examined the experience of IDDM patients with diabetes-related stigmata. IDDM patients who were interviewed, mentioned the reluctance of sharing the fact they have diabetes with their new partner, for example: *"We were talking about getting engaged … his mother didn't like me because I was a diabetic. She used to turn around to [him] and say 'don't marry [her] she's a responsibility, she will drag you down, she will get sick'. (#12, woman, age 44)"*(57). We can argue that experiences like this, can affect the IDDM patient and their willingness to share their disease with their new partners. Thinking more broadly, experiences like this can even damage the ego and self-confidence, not to mention the long-term emotional stability. Since it is a chronic disease that usually is diagnosed in early age, there are many obstacles in a variety aspects of life. It may be that we cannot fight over stigmata, but it should be brought up and increase awareness.

In conclusion, diabetes and relationships hold power on each other. While nonfunctioning relationships can affect diabetes, non-controllable diabetes may introduce stress into the relationship also. Even though there are not enough papers published on the topic, there should

be some effort to understand the difference between diabetic-diabetic relation and non-diabetic-diabetic relations. Not less important is to understand if and how much, a partner can affect glucose management. Since most diabetics are in the age of having relationships, and because it is usually the partner that, is the closest to the diabetic and can affect him/her the most, it is crucial to understand relationship-diabetes interactions.

Summery

Diabetes mellitus type 1 is a complexed disease. It can come with a complex of complications. It manifests and affects many levels of emotions, copings, and thoughts. Indeed, it is a disease of one person, but in the end, it can be "shared" by different social circles.

The psychological effect DM1 has on patients, is tremendous, and sometimes it is as important as the clinical status. Yet, it is underestimated if we look at the number of papers published on this subject, compared to clinical issues. On the positive side, due to current investment in new treatment methods which will reduce the level of diabetes-responsibility, it may be that those future treatments will also show benefit in the psychological aspect. Till then, we, as doctors and social circles, must seek to understand how to make diabetes-burden less heavy on our cared ones (and/or patients).

In this thesis, mentioned diversity of biologic, physiologic and, socio-psychologic factors which may act as risk factors. If we will succeed to individualize each patient with its own risk factors, it may be, that we will succeed to increase quality-of-life, quality-of-care and, motivation. By such measures, we may reach the ideal path of patient trust in self and in the medical team.

No need to mention that medical treatment is the most crucial factor in glucose management. Without insulin, DM1 patients cannot live. Then again, due to the frequent changes in dosing and timing, it is not only important to use the insulin but, to use it right. And here it is where, coping skills, supporting environment and demographic variables can make the change.

Biography

Adi Ashkenazi was born to Rafael and Ariella on July 6th 1992 in Tel-Aviv, Israel. From year 2011 to 2013, she volunteered the Israeli military, to the intelligence department of the navy unit. During years 2014-2020, Adi studied general-medicine in general School of Medicine University of Zagreb, Croatia. During studies Adi spent 3 months at the RAMBAM hospital as a study experience in the departments of Internal medicine and, Thoracic surgery. During her studies, Adi was the head of "Be Better Lecture Series", a project including lectures about broad topics in general-medicine. Also, in her sixth year, 2019-2020, she was the demonstrator of 3rd year students in the hospital KBC Rebro.

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