Emerging Adulthood and Type 1 Diabetes:

Insights from the DAWN2 Study

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Word Count (excluding figures/tables): 2946

Funding: Novo Nordisk funded the DAWN2 study, which was overseen by the DAWN2 Study Group (see [www.dawnstudy.com](http://www.dawnstudy.com/)).

Acknowledgements: The DAWN2 study was a global partnership of established organizations, including the International Diabetes Federation, the International Alliance of Patients' Organizations, the Steno Diabetes Center, and Novo Nordisk. We would like to thank the International Publication Planning Committee, and Mark Peyrot and Soren Skovlund in particular, for allowing us access to the data and for their support of these analyses.

Conflicts of Interest: None declared.

Whats New:

* Compared to ~~older~~ individuals with type 1 diabetes over age 30, emerging adults reported better overall quality of life but greater diabetes distress and lower levels of self-management.
* Diabetes education appears to be as valuable to emerging adults with type 1 diabetes as it is to ~~older~~ adults over 30.
* These results support the recommendation of assessing diabetes distress with emerging adults with type 1 diabetes. Assessing overall quality of life is likely to miss important psychological issues, specific to the experience of type 1 diabetes.

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**Abstract**

Aims: To compare clinical, psychological, education and social variables in emerging adults with type 1 diabetes (ages 18-30 years) with their ~~older~~ adult counterparts (> 30 years).

Methods: A single assessment multinational sample was surveyed as part of the larger second Diabetes Attitudes, Wishes and Needs (DAWN2) study. Participants completed a series of surveys incorporating demographic as well as clinical questions (comorbidities, hypoglycaemia) and validated self-report scales concerning psychosocial (health impact, quality of life, beliefs and attitudes, self-management behaviours, healthcare experience and family support) and diabetes education factors.

Results: Emerging adults differed from adults > 30 years of age ~~their~~ ~~older~~ ~~counterparts~~ on a number of psychosocial variables. Emerging adults reported better overall quality of life, social support and feeling supported by their healthcare team compared to ~~older~~ adults > 30 years. However, emerging adults experienced greater diabetes-specific distress and were less engaged in self-management. Diabetes education was related to a number of indicators, while experience of discrimination was harmful; however, these impacts did not differ between emerging adults and ~~older~~ adults > 30 years. An ~~post-hoc~~ analysis of geographical regions suggested that emerging adults in North America and Europe reported better well-being than ~~older~~ adults > 30 years, while the converse was observed in Asia.  
Conclusions: Emerging adults, particularly those in the later phase (ages 25-30 years) are especially at risk in terms of diabetes-specific distress. There is a need for novel interventions to meet the needs of these vulnerable emerging adults more effectively.

**Introduction**

Transitioning from adolescence into adulthood appears to be more challenging now than in the past. What typically occurred between ages 18 and 22 years (dependence to autonomy) now extends to age 30. The term “emerging adulthood” describes this transition from parental care ~~and~~ to assuming personal responsibility for choices (1). Emerging adulthood involves two stages; 18 – 24 years where educational attainment and beginning independence occurs and 25-30 years where one’s life pursuits are established (1). The burden of diabetes may add to the numerous psychosocial challenges associated with emerging adulthood (2). There is an increased risk of adverse health outcomes, yet little is known about effective interventions to avoid these risks (2, 3).

While much has been written about the period during which children transition to adult diabetes service, especially since this is associated with worsening diabetes control and loss to follow up (4, 5), less attention has been paid to what happens post transition. It is unknown whether there are issues unique to emerging adults with type 1 diabetes that need to be incorporated into diabetes services. This paper presents data on this issue from the second Diabetes Attitudes Wishes and Needs (DAWN2) study (6). Specifically, emerging adults were compared to adults > 30 years of age regarding the impact of diabetes on quality of life, beliefs and attitudes, self-management behaviours, healthcare experiences, family and community support, diabetes education and management support and perceived future needs for diabetes care.

**Methods**

Design

DAWN2 is a survey study conducted in 17 countries (Algeria, Canada, China, Denmark, France, Germany, India, Italy, Japan, Mexico, The Netherlands, Poland, the Russian Federation, Spain, Turkey, the UK and the USA) across four continents (7). People with diabetes, family members and healthcare professionals participated in DAWN2. People with diabetes were recruited by internet, telephone and in-person methods relevant to each country’s situation (internet penetration). Each country’s sample included 80 people with Type 1 diabetes (T1DM). Surveys were completed between March and May 2012.

Participants

For this analysis, we selected those with T1DM and categorized them as emerging adults (age 18 – 30 years) and adults (>30 years). 1368 of the 8596 participants had T1DM (15.9%). 308 (22.5%) of those with T1DM were emerging adults (aged 18-30 years) and 1060 (77.5%) were adults > 30 years of age. Within the group of emerging adults, 139 (45.1%) were in the early phase of emerging adulthood (18 – 24 yrs) and 169 (54.9%) were in the later phase (25 – 30 yrs).

Questionnaires

Participants completed surveys including demographic and clinical questions as well as validated scales assessing psychosocial health/well-being. The survey included screening questions to determine eligibility for the study (7), basic demographics (work status, country of origin, ethnicity, income) and diabetes profile (comorbidities, hypoglycemia) followed by an assessment of health impact/quality of life, beliefs and attitudes, self-management behaviours, healthcare experiences, family and community support, diabetes education and management support and perceived future needs for diabetes care.

The following was extracted from the complete database for examination in this study: country of origin, experience of comorbidities, use of the insulin pump, frequency of hypoglycemia, impact of diabetes on life roles (physical health, financial situation, relationships, leisure activities, work/studies, and emotional well-being), diabetes education received (1;1 sessions, group sessions, internet based education and/or weight loss programs) and degree of helpfulness of education, and experience of being discriminated against. Experience of discrimination was assessed with the following question: “I have been discriminated against because I have diabetes (fully agree to fully disagree)”.

In addition, data from the following psychosocial instruments were extracted:

* EuroQol-5D (8) visual analogue scale (EQ-5D VAS) assessing overall quality of health; validated by Janssen (9).
* WHOQOL-BREF Global Quality of Life (10) item, a validated single item self-report measure of QOL (11).
* WHO-5 Well-Being Index (WHO-5,(12), a survey with a scoring algorithm to identify likely depression (a score of ≤28 indicative of moderate to severe depression); validated for diabetes (13).
* Problem Areas in Diabetes Scale 5 (PAID-5,(14, 15)) validated to assess diabetes-specific distress (16).
* Patient Assessment of Chronic Illness Care-DAWN Short Form (PACIC-DSF,(17, 18)), a modified and validated (19) version of the PACIC, which measures perceived self-management support.
* Summary of Diabetes Self-Care Activities measure (SDSCA-6;(20) validated to assess self-reported diabetes self-care activities (21).
* Diabetes Empowerment Scale-DAWN Short Form (DES-DSF; (22)) validated to assess self-efficacy (23).
* Health Care Climate DAWN Short Form3 (HCC-DSF; (24)) validated to assess patient experience of being in the healthcare system (25).

Procedure

Once individuals consented, they completed either an on-line or a paper and pencil format of the questionnaire, which was pilot tested to be completed within 20 minutes on one occasion.

Statistical Analys~~i~~es

All analyses were conducted as secondary analyses of the main DAWN2 study (7). The rationale behind the analyses mirrored the intent of the DAWN2 study; to gain comprehensive insight into the lived experience of diabetes. Specifically, an intentionally broad survey of a range of psychosocial issues relevant to living with diabetes was undertaken, including the impact of diabetes on health, quality of life, beliefs and attitudes, self-management behaviours, healthcare experiences, family and community support, diabetes education and management support and perceived future needs. In this study, we examined the subgroups of emerging adults and adults > 30 years of age with type 1 diabetes using this comprehensive framework. To offset the large number of statistical tests conducted we used multivariate analysis to examine families of measures (e.g., psychosocial measures). If significant, univariate analyses were conducted. For the chi-square analyses, we considered significance levels between p < 0.05 and p = 0.01 tentative and p < 0.01 to be interpretable.

The emerging adult group was compared to the adult group using ~~t-tests for continuous data and~~ chi-square analyses for categorical data ~~(main analysis)~~. Continuous data were first tested for normality, and in the cases where the data were not normally distriuted (which was in the majority of cases), a nonparametric test was used to compare groups (Mann-Whitney test). ~~A secondary~~ An additional analysis compared the early (18-24 yrs) and later (25-30 yrs) emerging adult groups. In both cases, the two groups were compared on the scales listed above. In addition, whether diabetes education had a differential impact on the emerging adults compared with the ~~older~~ adults > 30 years of age was examined using a group (emerging adults versus ~~older~~ adults) by education (received education or not) analysis of variance on continuous measures. We conducted separate analyses for 1:1 education and group education. This analysis yields main effects for age (which indicates if the emerging adults and ~~older~~ adults > 30 years of age differ on that factor), and education (which indicates if those receiving education differ on that factor) and an interaction effect. If education impacts emerging adults differently than ~~older~~ adults > 30 years the interaction would be significant. A similar examination of the potential differential impact of discrimination between emerging adults and adults was conducted using a group by experience of discrimination analysis of variance on continuous measures. Finally, an ~~post hoc~~ exploratory analysis examining geographical region was conducted. The sample size was not sufficient to compare all 17 countries so countries were merged into regions. Region was evaluated by conducting linear mixed modelling analyses to address the issue of correlation between individuals within country. In these analyses, there were two between groups factors: emerging adult group and region. The sample was divided into three regions: North America (Canada, Mexico and the US), Europe (Denmark, France, Germany, Italy, Netherlands, Poland, Russia, Spain and the UK), and Asia (China, Turkey, India and Japan). The one African country (Algeria) was not included in the analyses.

**Results**

Demographic data are presented in Table 1. There were roughly equal men and women in both groups of emerging adults and adults > 30 years. As expected, emerging adults were younger and had a shorter duration of diabetes. The adult > 30 years of age group were slightly older at diagnosis than the emerging adults.

Emerging adults versus ~~older~~ adults > 30 years of age

There were no differences between the groups in the use of the insulin pump or in the experience of hypoglycaemic events (Table 1, all p values > 0.05). The emerging adult group had fewer diabetes complications (retinopathy, neuropathy, MI, sexual dysfunction), all of which were mediated by duration of diabetes.

A multivariate analysis involving perceived health, quality of life, diabetes distress and empowerment was highly significant (Wilk’s Lambda = 9.16, p < 0.001), justifying univariate analyses.Regarding perceived health and general quality of life, the emerging adulthood group was happier. Significant differences occurred for ~~all variables;~~ perceived health status, global quality of life, well-being and likely depression (p’s < 0.05). When diabetes distress was examined, the opposite was found. That is, with a disease-specific measure, the emerging adults reported significantly greater diabetes distress than ~~the~~ ~~older~~ adults > 30 years of age. The emerging adult group scored higher (more distress) on the total scale as well as on the percentage within the high distress group. Furthermore, emerging adults were worse off than ~~older~~ adults > 30 years of age regarding fear of living with diabetes, depressive symptoms about diabetes, worries about the future (p = 0.034), and finding that diabetes takes up too much time. Additional distress items assessing feeling overwhelmed, anxious and scared also showed a significant difference between groups, with the emerging adulthood group being more distressed.

Impact of diabetes on life roles and empowerment did not differ between groups. In terms of self-management, an initial multivariate analysis of variance on self-management behaviours weas significant (Wilk’s Lambda = 4.58, p < 0.001). Univariate analyses indicated that the emerging adult group scored lower on several self-management behaviours (healthy eating, self-testing, self-medicating) and more emerging adults, compared to ~~older~~ adults > 30 years of age, saw the need to improve healthy eating, self-testing and taking medication.

While participation rates for one-on-one or group education was equal between the two groups, the emerging adulthood group was more likely to seek education on the internet and also to participate in weight loss and/or motivation groups. ~~The~~ ~~older~~ Adults > 30 years of age were less likely to rely on any informational resources than emerging adults.

A multivariate analysis of the support measures (main support, PACIC, HCC) was significant (Wilk’s Lambda = 4.75, p = 0.003), justifying univaritate analyses. The emerging adults reported experiencing greater support from the main support person in their life. They also reported receiving more person-centred care, on both the PACIC and the HCC scales. There was no difference between groups in the experience of discrimination based on diabetes. Almost a third of each group reported experiencing discrimination.

Early vs later phase of emerging adulthood

A similar analysis comparing those in the early phase of transition (18 – 24yrs) to those in the later phase (25 – 30 yrs; Table 2) revealed few differences with the exception of psychological and social factors. A multivariate analysis of the psychological facitrs (health status, quality of life, diabetes distress and empowerment was significant (Wilk’s Lambda = 2.63, p = 0.035). Those in the later phase of emerging adulthood (25-30 yrs) reported lower quality of life and greater diabetes distress. On the specific items of the distress scale later phase emerging adults reported greater fear of living with diabetes, feelings of depression, worry over the future,  feeling overwhelmed and trouble coping with complications. The only other measure that differed between phases of emerging adulthood was that those in the later phase reported fewer number of supportive people and slightly less support from the main person, however the multivariate analysis of support measures was not significant (Wilk’s Lambda = 1.40, ns).

Impact of education and discrimination on Emerging Adults

Table 3 shows that none of the education interaction analyses were significant, indicating that neither group nor 1:1 education had a differential impact on emerging adults compared to ~~older~~ adults > 30 years of age. The results show that both types of education were associated with improved self-management and better psychosocial health for both emerging adults and adults.

A similar analysis examining the experience of discrimination was conducted (Table 4). Again, none of the interaction terms were significant indicating the experience of discrimination did not have a differential impact on emerging adults compared to ~~older~~ adults > 30 years of age. However, these data show that those reporting discrimination functioned more poorly on most measures of psychological functioning.

Regional Trends

Table 5 shows the impact of region and the interaction between emerging adulthood and region measured collected. Only two of the interaction effects were significant suggesting that ~~any differences between~~ the experience of emerging adults and adults > 30 years of age do ~~is~~ not ~~different~~ differ across regions. The exceptions were for self-testing blood glucose and overall well-being. Regarding self-testing blood glucose, emerging adults tested as frequently as adults > 30 years in Europe (5.4 versus 5.6 days/week) whereas emerging adults from Asia (3.6 versus 4.0) and North America (4.1 versus 5.4) tested less frequently. Regarding well-being, while emerging adults from Europe (58.4 versus 54.3) and North America (65.0 versus 58.8) reported higher well-being, emerging adults from Asia (51.9 versus 58.8) reported lower well-being compared to adults > 30 years of age.

While few interaction effects were significant in this analysis there were strong regional differences overall. Regarding self-management behaviours Europeans reported being more active and more likely to test blood glucose as recommended than Asians or North Americans. North Americans, on the other hand, were more likely to report checking their feet and taking medication as prescribed than those from Europe or Asia. Regarding psychological functioning, Asians reported more diabetes distress (higher scores on the problem areas in diabetes scale and greater percentage with diabetes distress). Empowerment scores were lowest for Europeans compared to Asians or North Americans. North Americans scored highest on the patient centered communication scales, Europeans the lowest. Finally, Europeans reported higher rates of discrimination than those from Asia or North America.

**Discussion**

Type 1 diabetes is a burdensome disease, associated with a number of psychosocial challenges(26). The emotional burden of diabetes has been recognized for some time, and screening for depression is now a standard of care(27). Recent literature has begun to understand the psychosocial burden of diabetes more thoroughly, with recognition of diabetes-specific aspects of distress(28). The concept of diabetes distress has been validated as separate from depression per se. In addition, recent literature is beginning to understand the psychological burden of hypoglycemia (29, 30), another disease-specific issues. The DAWN2 study, the parent study for this paper, has tried to further this literature by assessing a large multinational sample on a host of diabetes related variables. This has provided the context for an examination of developmental issues in adjusting to type 1 diabetes. A recognized issue in diabetes is the challenges associated with the transition from child to adulthood(4). While this is clearly a worthwhile area of focus, challenges of moving into adulthood are made complex by the extended nature of adaptation in our current society. So once successfully transitioned from child to adult diabetes care there may be more to the story of adjustment. In this study we had access to a large sample of emerging adults with type 1 diabetes, who could be compared to their adult counterparts.

This study found that emerging adults differ in interesting ways from ~~older~~ adults > 30 years of age with T1DM. First, emerging adults experience less burden in regard to general happiness and quality of life. They rate their health status as better, their overall quality of life and well-being as higher, with fewer reporting likely depression. In contrast to this optimistic finding, the disease-specific experience of living with diabetes is poorer for emerging adults compared to ~~older~~ adults > 30 years of age. Emerging adults report greater diabetes distress in general and also more emerging adults fall into the high distress category. Further, emerging adults score higher on virtually all of the items of the distress scale.

The increased distress in living with T1DM in the emerging adult group is even more of a concern in light of the fact that emerging adults report more support from their main support person and also report higher levels of positive patient-provider relationships than ~~older~~ adults > 30 years of age. This would suggest that diabetes distress stems from a psychological issue more so than from a lack of helping relationships or support.

Our results are interesting in that they emphasize the importance of understanding the lived experience of diabetes specifically. If one were not to assess diabetes specific distress the emerging adults would appear to be doing better than ~~older~~ adults > 30 years of age. Instead, the data suggest that emerging adults need specific help in addressing the psychological burden of diabetes. This finding is consistent with the recent trend in the literature that validates the disease-specific aspects of diabetes as dominant vis a vis psychosocial impact (26, 31).These results also raise the concern that if emerging adults were to avoid thinking about their diabetes they might have an improved psychological experience. That is, life would be good; they would be happy and also happy with their care. This challenges diabetes management because it implies that the emerging adult might experience diabetes self-management education as causing distress. This would certainly support the role of emotion management as standard care for the emerging adult.

In addition to the increased disease impact on quality of life for the emerging adults these individuals engaged less in self-care. Significant differences were found for healthy eating, self-monitoring and self-medication. Interestingly the emerging adults appear to be quite aware of these self-management deficits as more of them identified healthy eating, self-testing and medication adherence as areas where they were attempting to improve.

We conducted an additional ~~secondary~~ analysis to compare the two phases of emerging adulthood, where differences occurred in psychological and social factors. Those in the later phase of emerging adulthood were more negatively impacted by diabetes and had fewer support individuals. Those in this older age range experienced lower quality of life as well as lower levels of well-being. They also experienced greater diabetes distress suggesting that this later phase of development might be particularly difficult for coping with diabetes. Emotional management interventions targeted toward this specific group might be very valuable.

In addition to examining the differential features between emerging adults and ~~older~~ adults > 30 years of age we were also interested in seeing whether diabetes education had a differential impact on emerging adulthood and if the experience of discrimination had a differential impact. Our results suggested that the benefits of education and the risks of experiencing discrimination had similar effects on emerging adults as they did on ~~older~~ adults > 30 years of age living with T1DM. For both groups participation in education is associated with greater self-management. Emerging adults were more likely to pursue novel forms of diabetes education, such as online education or motivational interventions. This is not surprising and can be helpful to diabetes educators in that it might support the development of novel approaches to diabetes education; for example, approaches that might make better use of technology (32). Furthermore, in both groups almost 30% reported to have been discriminated against due to their diabetes, which was associated with poorer psychosocial health.

Given that the DAWN2 study involved such a geographically broad survey, we conducted an ~~post hoc~~ exploratory analysis of the impact of geographical region. The results of these analyses need to be considered tentative. The results indicated that geographical region did not impact the experience of emerging adults for most variables. In Europe emerging adults tested blood glucose as frequently as adults, whereas they tested less frequently in the other regions. As well, emerging adults reported lower levels of well-being in Asia, wheresas the opposite was true in Europe and North America. These regional differences in the impact of emerging adulthood on diabetes should be studied further. Further, our ~~post hoc analysis~~ analyses found strong regional differences overall. Europeans, relative to Asians and North Americans, were more active and more likely to test blood glucose as recommended whereas North Americans reported greater adherence to medication and feet checks. Further, Asians reported greater diabetes distress. Europeans reported more discrimination and less empowerment. North Americans reported higher levels of patient centered communication. These results support a more prospective examination of regional differences in the psychosocial aspects of diabetes.

Strengths of the study are its multinational nature and the sample size as well as the use of validated scales. Limitations include that this is a post hoc analysis of a convenience sample. The intent of DAWN2 was not to compare emerging adults to ~~older~~ adults > 30 years of age with type 1 diabetes (only 15.9% of the surveyed sample were living with type 1 diabetes). Follow up research should selectively recruit emerging adults with type 1 diabetes.

**Table 1**

**Comparison of Emerging Adults and Adults on DAWN2 Outcome Variables**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | **Emerging Adults**  **(N=308)** | **Adults**  **(N=1060)** |  |
| **Demographics** | Male | 48.7% (150) | 47.6% (501) |  |
| Female | 51.3% (158) | 52.45% (559) |  |
|  |  |  |  |
| Current Age | 24.97 (3.60) | 47.66 (11.350 |  |
| Age at diagnosis | 17.05 (6.57) | 20.25 (7.79) |  |
| Duration of Diabetes | 7.94 (6.30) | 27.42 (13.38) |  |
|  |  |  |  |
| **Pump Useage** | % | 13.3% (41) | 16.7% (177) | Χ2 = ns |
|  | | | |  |
| **Frequency of Lows** | % 1/day | 5.7% (18) | 5.3% (56) | Χ2 = ns |
| % 1/week | 24.0% (74) | 21.2% (225) |
| % several/month | 24.7% (76) | 26.6% (282) |
| % 1/month | 17.3% (53) | 14.6% (155) |
| % < 1/month | 19.3% (59) | 20.4% (216) |
| % 0 in past year | 9.0% (28) | 11.8% (125) |
| # severe hypos reported | 3.03 (6.38) | 2.82 (6.53) | t = ns |
|  | | | |  |
| Comorbidities/  Complications  ***Note: in all cases relationship disappeared when adjustment was made for diabetes duration*** | % Stroke | 5.2% (16) | 8.1% (86) | Χ2 = ns |
| % Delayed healing | 12.0% (25) | 13.5% (143) | Χ2 = ns |
| % Amputation | 1.3% (4) | 2.1% (22) | Χ2 = ns |
| % Nephropathy | 11.4% (24) | 12.7% (135) | Χ2 = ns |
| **% Retinopathy** | **21.1% (65)** | **35.9% (380)** | **p < 0.001** |
| **% Neuropathy** | **11.0% (34)** | **19.8% (210)** | **p < 0.001** |
| % Sexual dysfunction | 9.4% (29) | 14.9% (158) | p = 0.014 |
| **% MI** | **3.6% (11)** | **12.9% (137)** | **p < 0.001** |
| % Depression | 32.1% (102) | 32.0% (339) | Χ2 = ns |
|  | | | | |
| Health Status | **EQ-5D VAS1** | **72.80 (17.89)** | **68.18(18.68)** | **p < 0.001** |
|  | | | | |
| GLOBAL QOL  (WHO-QOL-Bref) | Total Score1 | 3.44 (0.83) | 3.30 (0.86) | **p = 0.005** |
| % Poor/Very Poor QoL  **% Good/Very Good QoL** | 10.1% (31)  **49.7% (153)** | 14.5% (154)  **40.2% (414)** | p = 0.044  **p = 0.003** |
|  | | | | |
| Well-Being  (WHO-5) | Total Score1 | 58.19 | 55.45 | ns |
| **% Likely Depression** | **9.1% (28)** | **14.9% (158)** | **p = 0.009** |
|  | | | | |
| Diabetes Distress  (PAID-5) | **Total Score1** | **44.14 (24.73)** | **38.86 (24.67)** | **p = 0.001** |
| **% Distressed** | **60.1% (185)** | **50.8% (538)** | **p = 0.004** |
| **PAID Item Scores** | | | |
| **Scared living with DM1** | **2.6 (1.15)** | **2.34 (1.17)** | **p < 0.001** |
| **Depressed1** | **2.66 (1.20)** | **2.33 (1.19)** | **p < 0.001** |
| Worrying re future1 | 3.15 (1.17) | 3.00 (1.18) | p = 0.034 |
| **Takes up too much time1** | **2.77 (1.18)** | **2.50 (1.19)** | **p = 0.001** |
| Coping with complications1 | 2.66 (1.21) | 2.61 (1.20) | ns |
|  | **Extra Items** | | | |
| Overwhelmed1 | 2.58 (1.21) | 2.39 (1.20) | p = 0.012 |
| **Anxious and Guilty1** | **2.78 (1.23)** | **2.51 (1.19)** | **p = 0.001** |
|  | | | | |
| DiabetesImpact | **Total Score** | | | |
| Health impact1 | 3.22 (1.19) | 3.33 (4.32) | ns |
| Financial impact1 | 3.53 (1.19) | 3.42 (3.20) | ns |
| Relations impact1 | 4.11 (1.20) | 4.08 (4.30) | ns |
| Leisure impact1 | 3.69 (1.18) | 3.64 (3.16) | ns |
| Work impact1 | 3.68 (1.20) | 3.56 (1.26) | ns |
| Emotion impact1 | 3.47 (1.26) | 3.42 (1.26) | ns |
| **% Negative Impact** | | | |
| Health | 68.2% (210) | 68.2% (723) | Χ2 = ns |
| Finances | 45.4% (140) | 49.4% (524) | Χ2 = ns |
| Relationships | 24.4% (75) | 26.9% (285) | Χ2 = ns |
| Leisure | 42.9% (132) | 47.2% (500) | Χ2 = ns |
| Work/Study | 40.3% (124) | 39.1% (414) | Χ2 = ns |
| Emotions | 53.6% (165) | 53.0% (562) | Χ2 = ns |
|  | | | |  |
| **Empowerment1** |  | **45.47 (18.89)** | **43.00 (20.84)** | **p < 006** |
|  | | | | |
| Self-Management | **Healthy meal plan1** | **4.61 (2.31)** | **5.03 (2.23)** | **p = 0.002** |
| Activity1 | 3.72 (2.27) | 3.61 (2.52) | ns |
| **Self-Testing1** | **4.79 (2.38)** | **5.11 (2.44)** | **p= 0.007** |
| Self-Test as recommend1 | 4.56 (2.42) | 4.79 (2.58) | P = 033 |
| Check feet1 | 3.52 (2.60) | 3.80 (2.80) | ns |
| **Self-Medicate1** | **5.54 (2.08)** | **6.09 (1.75)** | **p < 0.001** |
| Areas trying to improve | | | |
| **Eating healthy** | **72.7% (224)** | **63.5% (662)** | **Χ2 = 0.003** |
| Being active | 64.3% (198) | 59.1% (626) | Χ2 = ns |
| **Taking medication** | **44.3% (136)** | **35.8% (379)** | **Χ2 = 0.006** |
| Testing blood glucose | 50.0% (154) | 42.4% (449) | Χ2 = 0.017 |
| Dealing with emotions | 37.7% (116) | 35.4% (365) | Χ2 = ns |
| Maintaining weight | 53.6% (165) | 53.2% (564) | Χ2 = ns |
| Blood glucose Control | 51.3% (158) | 51.7% (548) | Χ2 = ns |
| None of these | 3.6% (11) | 6.8% (72) | Χ2 = 0.037 |
|  | | | | |
| Support | **Main Person1** | **62.94 (21.05)** | **59.77 (22.44)** | **p < 0.000** |
| **How many people?1** | **5.38 (10.02)** | **4.37 (7.41)** | **P = 0.004** |
| Overall Support1 | 28.57 (33.63) | 19.44 (31.57) | ns |
|  | | | | |
| Person-Centered Care | **PACIC total1** | **47.42(22.54)** | **40.11 (23.42)** | **p < 0.001** |
| **Healthcare Climate1** | **54.04 (25.39)** | **49.88 (28.38)** | **p < 0.001** |
|  | | | | |
| Diabetes Education | **Participating** |  |  |  |
| 1:1 | 56.7% (175) | 49.9% (529) | Χ2 = ns |
| Groups | 40.0% (123) | 39.3% (417) | Χ2 = ns |
| **Internet** | **44.0% (135)** | **26.9% (285)** | **Χ2 < 0.001** |
| **Weight loss group** | **47.3% (146)** | **30.5% (323)** | **Χ2 < 0.001** |
| **Motivation group** | **27.3% (84)** | **2.9% (31)** | **Χ2 = 0.002** |
|  |  |  |  |
| **Value** |  |  |  |
| **1:11** | **3.63 (1.24)** | **3.79 (1.20)** | **P < 0.001** |
| Groups1 | 3.71 (1.14) | 3.67 (1.24) | ns |
| Internet1 | 3.67 (1.06) | 3.68 (1.00) | ns |
| Weight loss group1 | 3.83 (1.08) | 3.68 (1.20) | ns |
| Motivation group1 | 2.33 (1.53) | 1.50 (0.71) | ns |
|  | | | | |
| Don’t rely on resources |  | **19.8% (61)** | **29.0% (307)** | **Χ2 = 0.001** |
|  | | | | |
| Discrimination | % experienced | 29.2% (90) | 28.8% (305) | Χ2 = ns |

1 – Data not normally distributed, Mann-Whitney Nonparametric analysis used.

**Table 2**

**Difference Between 18-24 and 25-30 Emerging Adults**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | **Emerging Adults**  **(18 – 24 years)**  **N = 139** | **Emerging Adults (25-30 years)**  **N = 169** | **p-value** |
| **Pump Useage** | % | 15.8% (22) | 11.2% (19) | Χ2 = ns |
|  | | | |  |
| **Frequency of Lows** | % 1/day | 6.6% (9) | 4.9% (8) | Χ2 = ns |
| % 1/week | 27.0% (38) | 21.5% (36) |
| % several/month | 24.1% (33) | 25.2% (43) |
| % 1/month | 15.3% (26) | 19.0% (32) |
| % < 1/month | 16.8% (23) | 21.5% (36) |
| % 0 in past year | 10.2% (14) | 8.0% (14) |
| # severe hypos reported | 3.13 (6.59) | 2.93(6.21) | ns |
|  | | | |  |
| Comorbidities/  Complications | % Stroke | 6.5% (9) | 4.1% (7) | Χ2 = ns |
| % Delayed healing | 15.8% (22) | 8.9% (15) | Χ2 p = 0.062 |
| % Amputation | 0.7% (1) | 1.8% (3) | Χ2 = ns |
| % Nephropathy | 10.1% (14) | 12.4% (21) | Χ2 = ns |
| % Retinopathy | 24.5% (34) | 18.3% (31) | Χ2 = ns |
| % Neuropathy | 8.6% (12) | 13.0% (22) | Χ2 = ns |
| % Sexual dysfunction | 9.4% (13) | 9.5% (16) | Χ2 = ns |
| % MI | 2.2% (3) | 4.7% (8) | Χ2 = ns |
| % Depression | 28.1% (39) | 35.5% (60) | Χ2 = ns |
|  | | | | |
| Health Status | EQ-5D VAS1 | 74.29 (16.56) | 71.56(18.87) | ns |
|  | | | | |
| GLOBAL QOL  (WHO-QOL-Bref) | **Total Score1** | **3.54 (0.81)** | **3.35 (0.83)** | **p = 0.033** |
| % Poor/Very Poor QoL  **% Good/Very Good QoL** | 7.9% (11)  **56.1% (78)** | 11.8% (20)  **44.4% (75)** | ns  **p = 0.040** |
|  | | | | |
| Well-Being  (WHO-5) | Total Score1 | 60.49 (20.64) | 56.31 (19.15) | ns |
| % Likely Depression | 7.2% (10) | 10.7% (18) | ns |
|  | | | | |
| Diabetes Distress  (PAID-5) | **Total Score1** | **40.14 (25.12)** | **47.43 (23.99)** | **p = 0.017** |
| **% Distressed** | **51.1% (71)** | **67.5% (114)** | **p = 0.003** |
| **PAID Item Scores** | | | |
| **Scared living with Diab1** | **2.40 (1.16)** | **2.76 (1.11)** | **p = 0.006** |
| **Depressed1** | **2.50 (1.19)** | **2.79 (1.19)** | **p = 0.035** |
| **Worrying re future1** | **3.00 (1.22)** | **3.27 (1.11)** | **p = 0.044** |
| Takes up too much time1 | 2.65 (1.23) | 2.86 (1.14) | ns |
| **Coping with complications1** | **2.48 (1.24)** | **2.80 (1.19)** | **p = 0.014** |
|  | **Extra Items** | | | |
| **Overwhelmed1** | **2.42 (1.16)** | **2.71 (1.23)** | **p = 0.047** |
| Anxious and Guilty1 | 2.63 (1.21) | 2.90 (1.23) | p = 0.073 |
|  | | | | |
| DiabetesImpact | **Total Score** | | | |
| Health impact1 | 3.18 (1.18) | 3.24 (1.21) | ns |
| Financial impact1 | 3.53 (1.14) | 3.53 (1.23) | ns |
| Relations impact1 | 4.12 (1.24) | 4.11 (1.17) | ns |
| Leisure impact1 | 3.62 (1.24) | 3.74 (1.12) | ns |
| Work impact1 | 3.59 (1.20) | 3.75 (1.19) | ns |
| Emotion impact1 | 3.46 (1.26) | 3.47 (1.26) | ns |
| **% Negative Impact** | | | |
| Health | 69.1% (96) | 67.5% (114) | Χ2 = ns |
| Finances | 44.6% (62) | 46.2% (78) | Χ2 = ns |
| Relationships | 26.6% (37) | 22.5% (38) | Χ2 = ns |
| Leisure | 43.2% (60) | 42.6% (72) | Χ2 = ns |
| Work/Study | 43.9% (61) | 37.3% (63) | Χ2 = ns |
| Emotions | 53.2% (74) | 53.8% (91) | Χ2 = ns |
|  | | | |  |
| Empowerment |  | 45.04 (19.34) | 45.84 (18.56) | t = ns |
|  | | | | |
| Self-Management | Healthy meal plan1 | 4.69 (2.31) | 4.55 (2.32) | t = ns |
| Activity1 | 3.94 (2.28) | 3.54 (2.26) | t = ns |
| Self-Testing1 | 4.92 (2.35) | 4.68 (2.39) | t = ns |
| Self-Test as recommend1 | 4.58 (2.46) | 4.54 (2.40) | t = ns |
| Check feet1 | 3.73 (2.68) | 3.34 (2.52) | t = ns |
| Self-Medicate1 | 5.64 (2.06) | 5.46 (2.10) | t = ns |
| Areas trying to improve | | | |
| Eating healthy | 69.1% (96) | 75.7% (128) | Χ2 = ns |
| Being active | 64.0% (89) | 64.5% (109) | Χ2 = ns |
| Taking medication | 41.0% (57) | 47.3% (80) | Χ2 = ns |
| Testing blood glucose | 44.6% (62) | 54.4% (92) | Χ2 = 0.086 |
| Dealing with emotions | 33.1% (46) | 41.4% (70) | Χ2 = ns |
| Maintaining weight | 52.5% (73) | 54.4% (92) | Χ2 = ns |
| Blood glucose Control | 51.1% (71) | 51.5% (87) | Χ2 = ns |
| None of these | 4.3% (6) | 3.0% (5) | Χ2 = 0.037 |
|  | | | | |
| Support | **Main Perso**n1 | **62.77 (20.81)** | **63.10 (21.32)** | **P = 0.002** |
| **How many people?1** | **6.66 (11.62)** | **4.26 (8.25)** | **p < 0.001** |
|  | | | | |
| Person-Centered Care | PACIC total | 47.87(21.73) | 47.05 (23.25) | ns |
| Healthcare Climate | 55.64 (25.10) | 52.64 (25.61) | p = 0.057 |
|  | | | | |
| Diabetes Education | **Participating** |  |  |  |
| 1:1 | 64.2% (89) | 53.6% (91) | Χ2 = ns |
| Groups | 43.5% (60) | 40.8% (69) | Χ2 = ns |
| Internet | 51.1% (71) | 40.8% (69) | Χ2 = ns |
| Weight loss group | 53.0% (74) | 45.7% (77) | Χ2 = ns |
|  |  |  |  |
| **Value** |  |  |  |
| **1:11** | **3.78 (1.27)** | **3.48 (1.22)** | **p < 0.001** |
| Groups1 | 3.75 (1.19) | 3.68 (1.10) | ns |
| Internet1 | 3.70 (1.13) | 3.64 (1.00) | ns |
| Weight loss group1 | 3.94 (1.07) | 3.73 (1.10) | ns |
|  | | | | |
| Don’t rely on resources | **%** | 21.6% (30) | 18.3% (82) | Χ2 = ns |
|  | | | | |
| Discrimination | % experienced | 26.9% (37) | 34.4% (58) | Χ2 = ns |

1 – Data not normally distributed, Mann-Whitney Nonparametric analysis used.

**Table 3**

**Impact of Diabetes Education (1:1 or Group) On Self-Management and Psychological Functioning**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | **Emerging adults** **- Adults** | **1:1 Education** | **Interaction** |
| **1:1 Education**  **Group Education** | **Self-Management** | | | |
| **Healthy eating** | **p = 0.002** | ns | ns |
| **Activity** | ns | **p < 0.001** | ns |
| **Self-Testing** | **p = 0.022** | **p < 0.001** | ns |
| **Self-Test as recommend** | ns | **p < 0.001** | ns |
| **Check feet** | ns | **p = 0.001** | ns (0.075) |
| **Taking Medication** | **p < 0.001** | ns | ns |
|  | | | |
| **Psychological Impact** | | | |
| **Empowerment** | ns | **p < 0.001** | ns |
| **PACIC** | **p < 0.001** | **p < 0.001** | ns |
| **HCC** | **p = 0.031** | **p < 0.001** | ns |
| **PAID** | **p < 0.001** | ns | ns |
| **Emerging adults** **- Adults Group Education Interaction** | | | |
| **Self-Management** | | | |
| **Eating healthy** | **p = 0.033** | ns | ns |
| Activity | ns | p = 0.029 | ns |
| **Self-Testing** | ns (0.074) | **p < 0.001** | ns |
| **Self-Test as recommend** | ns | **p < 0.001** | ns |
| **Check Feet** | ns | **p < 0.001** | ns |
| **Taking medication** | **p < 0.001** | ns | ns (0.074) |
|  | | | |
| **Psychological Impact** | | | |
| **Empowerment** | ns | **p < 0.001** | ns |
| **PACIC** | **p < 0.001** | **p = 0.033** | ns |
| **HCC** | **p = 0.023** | **p = 0.016** | ns |
| **PAID** | **p < 0.001** | ns | ns |
|  |  |  |  |  |

**Table 4**

**Impact of Discrimination on Psychological Functioning**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | |  |
| **Experience of Discrimination** |  |  |  |  |
|  | **Emerging adults** **- Adults** | **Discrimination** | **Interaction** |
| **Empowerment** | ns | **p < 0.001** | ns |
| **PACIC** | **p < 0.001** | ns | ns |
| HCC | ns (0.079) | ns (0.060) | ns |
| **PAID** | **p = 0.001** | **p < 0.001** | ns |
| **WHO-Well Being** | ns | **p < 0.001** | ns |
| **% Likely Depression** | ns | **p = 0.001** | -- |
| **EQ-5D VAS** | **p = 0.002** | **p < 0.001** | ns |
| **QoL** | ns (0.074) | **p < 0.001** | ns |
| **% Good/Very Good QoL** | **p = 0.003** | **p < 0.001** | -- |
|  | | | | |

**Table 5**

**Impact of Region on Psychological Functioning and**

**Self-Management for Emerging Adults Compared to Adults**

|  |  |  |  |
| --- | --- | --- | --- |
|  | | **Region** | **ED x Region**  **Interaction** |
| **Region:**  North America (69 Emerging adults; 173 Adults)  Europe(156 Emerging adults; 571 Adults)  Asia (59 Emerging adults; 260 Adults) | **Self-Management** | | |
| **Healthy eating** | ns | ns |
| **Activity** | **p < 0.001** | ns |
| **Self-Testing** | **p < 0.001** | **p = 0.011** |
| **Self-Test as recommend** | **p < 0.001** | **p < 0.02** |
| **Check feet** | **p < 0.001** | ns |
| **Taking Medication** | **p = 0.046** | ns |
|  |  | |
| **Psychological Impact** | | |
| **Overall QoL** | **p < 0.001** | ns |
| **% with Poor QoL** | ns | ---- |
| **WHO-Well Being Index** | **p < 0.001** | **p = 0.039** |
| **% with Likely Depression** | ns | ---- |
| **PAID** | **p = 0005** | ns(p = 0.072) |
| **% with Diabetes Distress** | **p = 0.003** | ----- |
|  |  |  |
| **Empowerment** | **p = 0.006** | ns |
| **PACIC** | **p = 0.002** | ns |
| **HCC** | **p = 0.003** | ns |
| **Discrimination** | **p = 0.018** | ---- |

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