A Comparative Study of the Attitudes of Dental Students in Saudi Arabia and the United States towards Individuals with Developmental Disabilities

Zuhair M. Alkahtani

Thesis submitted in partial fulfillment of the requirement for the degree of Master of Science

Tufts University School of Dental Medicine

Master of Science

Dr. John Morgan

Associate Professor – Department of Public Health and Community Service

Dr. Cheen Loo

Associate Professor – Department of Pediatric Dentistry

Dr. Paul Stark

Professor – Director of Advanced and Graduate Education

Dr. Wanda Wright

Assistant Professor – Department of Public Health and Community Service

Abstract:

Background: Individuals with developmental disabilities (DD) experience poorer dental health than the general population. They have limited access to health care services and face barriers to maintaining good oral health. Dental schools provide minimal didactic and clinical training to prepare their students to manage individuals with disabilities. As a result, future dentists may not feel well prepared to provide dental care to these individuals.

Objective: This study was conducted to compare the attitudes of senior dental students at the Faculty of Dentistry at King Abdulaziz University (KAU), in Jeddah, in Saudi Arabia, and students at Tufts University School of Dental Medicine (TUSDM) in Boston, in the United States. The authors also aimed to determine if there was an association between pre-doctoral training in treating individuals with special needs, and having positive attitudes toward providing dental care to individuals with DD.

Methods: The authors surveyed 617 senior dental students at both schools using a 40-item online survey questionnaire. The questionnaire asked students about their experiences with individuals with DD, their pre-doctoral education in managing these individuals, and their attitudes toward these individuals. Data was analyzed using Chi-square tests, Independent Sample t-tests, Mann-Whitney U tests, and Spearman's rank correlation coefficient tests.

Results: Only 214 students responded to the online survey, with a response rate of 34.6%. Seventy six respondents (36.7%) were TUSDM students with a response rate of 21.2%, and 131 respondents (63.3%) were KAU students with a response rate of 50.8%.

Only 15 (11.6%) of KAU students, compared to 64 (86.5%) of TUSDM students ($p<0.001$), reported treating an individual with a DD. Seventy one (58.2%) of KAU students, compared to only 10 (13.5%) of TUSDM ($p<0.001$), reported not receiving any training in treating individuals with DD. Fifty six (57.1%) of KAU students, compared to only 15 (20.3%) of TUSDM students ($p<0.001$), reported that their education had not prepared them effectively to treat individuals with DD. There was a significant difference in the attitudes between students at KAU and students at TUSDM. Students at TUSDM had more positive attitudes, compared to students at KAU. Fifty six (45.9%) of the KAU students, compared to 47 (67.2%) of the TUSDM students ($p=0.047$), "strongly disagreed" or "disagreed" that they would not desire individuals with DD in their practice. Forty two (34.4%) of the KAU students, compared to 60 (85.7%) of the TUSDM students ($p<0.001$), "strongly disagreed" or "disagreed" that dental services for individuals with DD should only be provided in a hospital.

Discussion: Students at TUSDM had more positive attitudes toward individuals with DD, compared to KAU students. These differences in the attitudes may be attributed to the significant differences in students' experiences, education, and training in treating individuals with DD at both schools.

Conclusions: There is a significant difference in the attitudes between students at TUSDM and students at KAU. There is an association between pre-doctoral training in treating individuals with special needs, and having positive attitudes toward providing dental care to individuals with DD.

Acknowledgements:

First and foremost, I would like to express my sincere gratitude to my advisor Dr. John Morgan for his continuous support, patience and motivation. His guidance helped me throughout the time of research and writing the thesis. I also would like to thank the rest of the committee Dr. Paul Stark, Dr. Cheen Loo, and Dr. Wanda Wright for their encouragement, help and support.

I would like to thank Dean Huw Thomas and Dean Abdulghani Mira for granting me permission to survey senior dental students at TUSDM and KAU respectively. I also want to thank King Khalid University, the Saudi Arabian Ministry of Higher Education and the Saudi Arabian Cultural Mission for granting me this scholarship.

I also would like to thank my parents, brothers, and sisters for their prayers, and best wishes. Finally, I would like to thank my wife Huda and my daughter Ghala for cheering me up and standing by my side through the good times and bad.

Table of contents:

List of Tables:

List of Figures:

Introduction:

Individuals with developmental disabilities (DD) experience poorer dental health and have less access to quality care.[1]This troubling trend is mirrored by dentists' lack of willingness to, and confidence towards, treating this population with its unique needs. Understanding dental students' attitudes toward, and their educational experiences in, treating individuals with DD may help identify possible barriers that can prevent students from providing quality care to these individuals. Understanding these barriers may help dental schools develop special programs to ultimately improve this population's access to oral health care.

A few Saudi studies have investigated the attitudes of dentists toward individuals with hearing and visual impairments[2, 3] , but a paucity of research investigating the attitudes of dentists and dental students toward individuals with DD exists. This study seeks to expand our understanding by comparing the attitudes of dental students in Saudi Arabia and the United States toward the treatment of individuals with DD.

Developmental Disabilities:

Disabilities refer to a range of impairments, activity limitations, and participation restrictions. "In general, disabilities are characteristics of the body, mind, or senses that, to a greater or lesser extent, affect a person's ability to engage independently in some or all aspects of day-to-day life".[1] According to the United Nations, more than half a billion people worldwide are disabled as a consequence of mental, physical or sensory impairment.[4]

According to the Developmental Disabilities Act, section 102(8), "the term 'developmental disability' (DD) means a severe, chronic disability of an individual five years of

age or older that: 1) is attributed to a mental or physical impairment or a combination of mental and physical impairments; 2) is manifested before the individual attains age 22; 3) is likely to continue indefinitely; 4) results in substantial functional limitations in three or more of the following areas of major life activity: i) self-care; ii) receptive and expressive language; iii) learning; iv) mobility; v) self-direction; vi) capacity for independent living; and vii) economic self-sufficiency. 5) reflects the individual's need for a combination and sequence of special, interdisciplinary, or generic services, supports, or other assistance that is of lifelong or extended duration and is individually planned and coordinated, except that such term, when applied to infants and young children means individuals from birth to age five inclusive who have substantial developmental delay or specific congenital or acquired conditions with a high probability of resulting in developmental disabilities if services are not provided".[5]

Developmental disabilities include: attention-deficit/hyperactivity disorder (ADHD), autism spectrum disorders, cerebral palsy, Down syndrome, hearing loss, intellectual disability, vision impairment, and other developmental delays.[6,7] Recent estimates in the United States show that one in six, or about 14% of children between the ages of three and seventeen have a DD.[7]

Oral health problems:

The oral health problems of individuals with disabilities are complex. These problems may be due to underlying congenital anomalies as well as the inability to receive the personal and professional health care needed to maintain oral health.[3] The oral health of individuals with disabilities is compromised by their difficulty in maintaining daily hygiene, as well as their exposure to certain medications and therapies.[1]

Recent studies have demonstrated the link between disability, poor oral health, and disparity in access to care. In 2012, Morgan and colleagues reviewed dental records of 4,732 adults with intellectual and developmental disabilities (I/DD) receiving care at the Tufts Dental Facilities (TDF) serving patients with special needs. The authors required that participants were diagnosed with intellectual disability (ID), and were qualified for services from Massachusetts Department of Developmental Services (MA DDS). About 11% of this population was edentulous, and the mean number of teeth for dentate participants was 21.4 (SD = 7.0). Nearly 88% of dentate participants had caries experience and 32.2% had untreated caries. Furthermore, the prevalence of periodontitis for this population was 80.3%.[8]

In 2010, Anders and colleagues reviewed 27 studies to examine the oral health status of individuals with ID in comparison to the general population. Twenty five of the reviewed studies found that individuals with ID have poorer oral hygiene, higher rates of periodontal disease, and higher levels of untreated caries. Although the two remaining studies found no significant difference in the level of oral hygiene between the two groups, they still found higher levels of periodontal disease in individuals with ID.[9]

The Surgeon General's 2002 Conference report titled *Closing the Gap: A National Blueprint to Improve the Health of Persons with Mental Retardation,* identified health care issues for individuals with I/DD that need to be addressed: 1) increasing their access to care; 2) providing a comprehensive approach to the delivery of care to these individuals across their life span; 3) improving health care providers education and training; 4) reducing the stigma associated with I/DD with an increase of the public awareness.[10]

Access to care:

A recent groundswell of research and policy efforts has brought to light disparities in access to health care between individuals with DD and the general population.[10] It is important to mention two main factors that affected the access of individuals with DD to care.

A: Deinstitutionalization and mainstreaming:

In 1961, President John F. Kennedy created the *President's Panel on Mental Retardation*, advocating for education, employment, community living, and research into the causes and prevention of I/DD. The panel made 95 recommendations addressing scientific research, civil rights, normalization, improved community services, and limiting institutional facilities.[11] These recommendations were followed by legislative efforts to expand disabled rights, most notably with the passage of the Americans with Disabilities Act in 1990[12] and the United States Supreme Court decision in *Olmstead vs. L.C.* in 1999.[13] Respectively, these measures "provide a clear and comprehensive national mandate for the elimination of discrimination against people with disabilities" and declare the right of disabled individuals to live in community, rather than institutionalized, care.[14] The I/DD population has experienced dramatic changes since President Kennedy's call to action, including increased life expectancy and deinstitutionalization of care, integrating these individuals into community-based residences.[15,16] While these efforts created a community-based infrastructure to address residential, educational and social opportunities, "there was no parallel effort to ensure that a system of health care would be available for individuals with I/DD. Deinstitutionalization continued, but there were few community practitioners ready to provide health care for these patients".[14]

B: Advancements in health care:

The last few decades have seen a dramatic increase in life expectancy for persons with I/DD, which has – in turn – impacted their oral health care needs.[14,17] In the 1960s, the average life expectancy for a child with Down syndrome was three to four years. Now, the average life expectancy of these individuals is 55 years. Some even live to their sixties and seventies.[14,18] Recent data suggests that children with I/DD can now expect a close to normal life span.[17] As these individuals age, they are moved out of the pediatric dental care that has traditionally managed them. As a result, these individuals are having difficulty finding adequately trained community practitioners to treat them.[19]

Two recent studies conducted in the United States have found that individuals with DD face disparities in access to dental care. In the first authors used data from the 2001 North Carolina Behavioral Risk Factor Surveillance System (NCBRFSS) and the North Carolina National Core Indicators survey (NCNCI), to compare data on health status and utilization of health care among three groups of adults: No Disability, Physical Disability, and DD. Authors surveyed 6,902 individuals and found significant disparities in oral health care for the disability (23.2% of participants) and DD (13.7% of participants) groups compared to the no disability group. More than 14% of individuals with DD did not have their teeth cleaned for more than five years, compared to only eight percent of the no disability group ($p<0.05$). For the disability group, 19.9% reported that they had not seen a dentist for more than five years compared to only about nine percent of the no disability group ($p<0.01$). This study has a number of limitations: 1) BRFSS methodology probably excluded many adults with DD, because these individuals may not have the opportunity or the cognitive ability to respond to a telephone survey; 2) individuals with DD who responded to the survey might have not identified themselves as having a DD.[20]

The second study conducted in California, focused exclusively on 102 subjects with DD receiving services at the South Central Los Angeles Regional Center (SCLARC). Authors found that the average Decayed/Missing/Filled Teeth (DMFT) score for these individuals was 13.8 points (SD = 8.9), and that 65% of these individuals had active caries. Authors also found that 25% of subjects had no access to needed oral health care in the last 12 months. Limitations of this study were: 1) the small sample size; 2) the study could not report detailed information about the types and levels of the subjects' DD.[21] It is evident from these studies that individuals DD have limited access to oral health care, compared to the general population.

Barriers to care:

Several studies have identified barriers that could prevent dentists from providing care to individuals with disabilities.

A: U.S. studies:

In a 2003, Casamassimo and colleagues analyzed data from the American Academy of Pediatric Dentistry (AAPD) survey conducted in the summer of 2001. The AAPD survey included 4,970 general dentists chosen randomly by the American Dental Association (ADA) survey center. The AAPD survey asked dentists about their demographic characteristics and their practice pattern with children. Authors of the study used data concerning the practice patterns with children with special health care needs, which was only available for 1,251 general dentists (24%). Authors found that 52% of respondents stated that they "rarely saw" or "never saw" children with ID and 68% of respondents stated that they "rarely saw" or "never saw" children with Cerebral palsy. The dentists identified six barriers that affect their willingness to see children with special heath care needs. These were: 1) patient behavior; 2) level of disability; 3)

level of dental disease; 4) level of training; 5) office staff training; 6) availability of funds. When dentists were asked about their educational experiences with children with special needs, only 25% stated that they had hands-on educational experiences with this demographic. Forty percent of dentists felt that additional training in treating these patients would be desirable or very desirable. Moreover, the types of educational experiences these dentists reported receiving in dental school significantly affected how they perceived different factors as barriers to provide health care for these individuals. Dentists who reported receiving both hands-on and lecture-based educational experiences addressing treatment of children with special health needs in dental school were significantly more likely to report that they saw these patients often or very often (Cerebral palsy $p<0.0001$; ID $p<0.01$; Medically compromised $p<0.001$). They were also significantly less likely to perceive the patients' level of disability, level of disease, behavior, their staff's level of training, or their own level of training as barriers to their willingness to provide health care services for children with special health care needs ($p<0.05$) compared to dentists who received lectures only.[22]

Emphasizing the importance of educational experiences, another study conducted in the U.S. specifically addressed the educational backgrounds of 500 general dentists randomly chosen from a list of approximately 7,000 members of the Michigan Dental Association (MDA). A self-administered survey was mailed to these dentists in 2004. The survey asked questions about the dentists' educational backgrounds, their personal experiences, and attitudes concerning the treatment of individuals with special needs. Of the 208 dentists who responded, 22.7% reported not treating any adults with special needs and 51.6% reported not treating children with special needs. When dentists were asked about their attitudes towards treating adults and children with special needs, their willingness differed depending the type of disability those patients had. The

results showed that 70.8% of dentists were willing to treat adults and 59% were willing to treat children with ID; whereas 40.6% of dentists were willing to treat adults and 36.3% were willing to treat children with Cerebral palsy. For autism, 33% of dentists were willing to treat adults and 40.1% were willing to treat children. When dentists were asked about their pre-doctoral training and how it prepared them to treat adults and children with special needs, 25.9% of dentists felt that they were not at all well prepared to treat those patients, and only 1.8% felt well prepared to treat those patients. Dentists who felt well prepared were significantly more positive and more confident in their attitudes towards treating adults and children with special needs ($p<0.001$).[23]

The Surgeon General's report *Call to Action 2005* emphasized that improving education and training for providers of dental health care services for individuals with disabilities would address one of the barriers to oral health noted for this population.[24] Consequently, the surgeon general encouraged educators to "increase knowledge among health care professionals and provide them with tools to screen, diagnose, and treat the whole person with a disability with dignity".[24]

B: Non U.S. studies:

Studies examining these trends in other countries have reported on disparities in care and attitudes of dentists, both in treating individuals with disabilities and types of barriers to care. In a study conducted in the Netherlands, 170 children with severe ID were chosen from seven randomly selected daycare centers in the northwest part of the Netherlands. Sixty six of those children and their dentists (n=40) participated in the study. The children were examined at their daycare centers between July and November of 2004. Questionnaires then were sent to their caregivers and another version was sent to their dentists. Authors found that the mean DMFT for

those children was 3.0 (SD = 3.1), 54.4% of the children had untreated caries, and the mean number of untreated carious lesions was 1.9 (SD = 2.4). Researchers found that 31.9% of the children had not received regular professional oral health care. Meanwhile, dentists reported several barriers that could prevent them from providing care for those children. These barriers included communication problems, lack of financial compensation, and lack of experience in treating children with ID. More than 50% of dentists reported that treating children with severe ID was more difficult than treating children without disabilities, and 11.4% reported that treating children with severe ID was problematic. A limitation of the study was that no radiographs were made to determine proximal lesions.[25]

A study conducted in Greece found similar results. In 2007, the authors of the study randomly selected 750 dentists attending the 26th Annual Conference of the Hellenic Dental Association (HDA).Of those dentists, 534 completed the questionnaire and were included in the analysis. About 70% of the dentists reported that they have not been trained to treat individuals with physical or ID. The vast majority of respondents (91.7%) thought that providing oral health care for individuals with physical or ID was difficult, and of those, 65.7% had not received relevant training in treating these individuals. More than 70% of dentists thought that a relevant course in treating disabled individuals would be helpful. When dentists were asked about the barriers to providing care for these individuals, they responded with the following: 1) difficulties in accessing the dental office; 2) lack of cooperation by the patient; 3) communication problems; 4) financial compensation; and 5) lack of special training.[26]

A Taiwanese study investigated the lack of willingness of dentists to treat individuals with severe disabilities. Authors mailed questionnaires to 300 dentists working at teaching hospitals during the period between June and September of 2004. The questionnaire asked

dentists about their background information and their experiences in treating patients with severe disabilities. Of those dentists, 184 completed the questionnaire and were included in the analysis. When dentists were asked about barriers to treat these patients, their top three barriers to helping this patient demographic were: 1) communication problems (63.6%); 2) complicated procedures (59.1%); and 3) lack of encouragement from hospital policies (54.6%). When dentists were asked about prerequisites to treating individuals with severe disabilities, the top three were: 1) relevant professional training (83.7%); 2) prior experience in treating these patients (83.2%); and 3) adequate treatment time (82.6%).[27]

Dental Education:

Research has found that many primary care providers are ill-prepared or reluctant to provide routine dental care to individuals with disabilities.[22, 23, 25-27] In 1993, the Academy of Dentistry for Persons with Disabilities surveyed all U.S. and Canadian dental schools to assess the amount of curriculum time devoted to the care of individuals with disabilities. Forty nine schools responded to the survey (74%). The average number of lecture hours devoted to the dental management of individuals with disabilities in a typical four-year curriculum was about 12.9 hours, while the average clinical training time per student was 17.5 hours. Fourteen schools (29%) reported five hours or less of time devoted for the dental management of individuals with disabilities. Thirty two schools (65%) reported less than ten hours in the curriculum for management of individuals with disabilities.[28]

In 1999, a follow-up study was conducted to survey the special care curricula of the programs at all U.S. and Canadian dental schools. The survey was directed to individuals responsible for planning curricula at each school. Fifty one school representatives responded

(78%), of which 81% listed themselves as the "Associate Dean for Academic Affairs." The study revealed a decrease in the time devoted to training students in the care of individuals with disabilities. Twenty four respondents (53%) reported less than five hours of didactic training in managing individuals with disabilities; 73% of respondents reported five percent or less of clinical time devoted to managing individuals with disabilities.[29] Confirming first-hand reports[22, 23, 25-27] from practicing dentists, the results of these two studies report that during their pre-doctoral education, current dental students do not gain the necessary expertise to treat individuals with special needs.

In a study conducted in the U.S., 295 third and fourth year students from five dental schools were surveyed about their experiences and attitudes toward individuals with ID. A little more than half (50.8%) of fourth year students never provided any dental treatment for individuals with ID, while 60% of the same group of students indicated that they had little or no confidence in treating individuals with ID. Nearly 75% of fourth year students felt that they were not at all or little prepared to treat these individuals. A total of 68.2% of the students reported receiving less than five hours of didactic education, and less than five hours of clinical training in managing these individuals. On the other hand, dental students who had previous experience ($p<0.03$) or had relatives with ID ($p<0.04$), believed that they better understood the dental needs of these individuals. Students who had experience with individuals with intellectual disabilities had more positive attitudes compared to students who had no experience with these individuals ($p<0.003$ mild ID; $p<0.02$ severe ID).[30]

A longitudinal study was conducted at University at Buffalo School of Dental Medicine to evaluate the attitudes 82 third year dental students. For this study, authors used a questionnaire administered to the students throughout a course related to the treatment of individuals with ID.

Sixty seven students completed the surveys (82%), of those 53.7% of students reported having previous experience with individuals with ID. There was a significant association between having previous experience with individuals with ID and the comfort level in providing treatment for these individuals ($p=0.006$).[31]

Our study was conducted to survey the attitudes of senior dental students at the Faculty of Dentistry at King Abdulaziz University (KAU) in Jeddah, Saudi Arabia, and senior dental students at Tufts University School of Dental Medicine (TUSDM) in Boston, the United States of America, toward providing oral health care services to individuals with DD. We aimed to compare KAU students who do not receive special training in the treatment of individuals with disabilities to students at TUSDM, who receive special training for treating individuals with special needs. This study was conducted in an effort to identify deficiencies in dental experience and education in the treatment of individuals with DD, in order to determine the need to implement effective pre-doctoral dental programs for treating individuals with DD in Saudi and American dental schools.

Research Aims:

This study compared the attitudes of senior dental students at KAU to senior dental students at TUSDM. In addition, this study investigated whether pre-doctoral training affects the attitudes of dental students toward managing the oral health problems of this patient population.

Hypotheses:

Hypothesis 1:

There is a difference in the attitudes of Saudi and American senior dental students toward providing health care services for individuals with DD. American students have more positive attitudes toward providing care for individuals with DD, compared to Saudi senior dental students.

Hypothesis 2:

There is an association between pre-doctoral training for treating individuals with special needs and having a positive attitude towards providing dental health care services for individuals with DD.

Methods:

Study design:

This was a cross-sectional study that compared the attitudes of senior dental students at KAU and senior dental students at TUSDM. For this study we used a 40-item online questionnaire sent via email to students at both schools.

Study population:

Our study sample was a convenience sample, emails with links to the survey were sent to all senior dental students at both schools. A total of 617 senior dental students were included in the study; 359 TUSDM students (178 who graduated in 2012, and 181 who graduated in 2013), and 258 KAU students (128 who graduated in 2012, and 130 who graduated in 2013). We aimed to collect information from senior dental students before their graduation, insuring that some TUSDM students had received their special care week rotation before taking the survey

Survey development:

We developed our questionnaire using a dedicated literature review, using PubMed, Medline and Google and a curated collection of key search terms. These included “dentistry”, “disability”, “developmental disabilities”, “attitudes”, “dentists”, “dental students”, “dental questionnaire”, “dental survey”, “survey” and “questionnaire”.

After reviewing several survey instruments addressing attitudes, knowledge and experience used by other groups studying sensory impairments[2,3], epilepsy[32], cleft palate[33], and

dental students' attitudes toward individuals with disabilities[34], we developed the 40-item questionnaire, which included four sections.

The first section asked students about background information including age, gender, citizenship, anticipated year of graduation, which school they are attending, and their primary area of interest. The second section assessed students' exposure to, or experience in, treating individuals with DD. In this section respondents were asked about their experience in treating individuals with DD, and their personal experiences with individuals with DD. Students were also asked to report how they rated their experience in treating these individuals on a five point scale, five being "excellent" and one being "poor". The third section aimed to collect information about training and education in treating individuals with DD. Students were asked if they had received clinical training for treating individuals with DD and how that education prepared them. The fourth section was an evaluation of students' attitudes and interest in treating individuals with DD. In this section, respondents were asked to report how they "agreed" or "disagreed" with attitude statements regarding their educational experiences in treating individuals with DD, their perception of their instructors, their interpersonal and future interactions with individuals with DD. For these statements a five point scale was used, five being "strongly agree", and one being "strongly disagree". Students were also asked about their primary concern in treating individuals with DD, and were asked about their interest in providing dental treatment to this population.

The questionnaire for this study required validation. The questions were validated using face validity and internal validity tests before they were included in this study. For face validity, the questionnaire was distributed to five dental students. The student investigator sat with each student separately and determined that each student fully understood the meaning and intent of

each question. For internal validity, the questionnaire was distributed to five additional students who were asked to complete it. The following day, these students were asked to complete the questionnaire again. The questionnaire was collected from those five students and it was determined that their answers were the same for both survey administrations. After validation, the survey questionnaire was constructed on the website www.surveymonkey.com, in order to send it as a link via email to senior dental students at both schools.

Procedure:

The questionnaire was sent via email to senior dental students of the class of 2012 of both schools during April and May of 2012. Emails reminding the students of the opportunity to take the survey and the survey link were sent to the class of 2012 one week, two weeks, three weeks, four weeks, and five weeks after the original email in April 2012.

The questionnaire was also sent to senior dental students of the class of 2013 between October of 2012 and March of 2013. Email reminders were sent to the class of 2013 one month, two months, three months, four months, and five months post the sending of original email in October 2012.

This study was approved by the Institution Review Board (IRB) at Tufts University Health Sciences Campus, and the Research Ethics Committee at the Faculty of Dentistry King Abdulaziz University. Letters of approval for surveying the students were also obtained from Dean Huw Thomas at TUSDM and Dean Abdulghani Mira at KAU.

Data analysis:

Responses were collected during April of 2013 and were processed using the Statistical Package for the Social Sciences (SPSS), Version 19. Data was analyzed using Chi-square tests, Independent sample t-tests, Mann-Whitney U tests, and Spearman's correlation coefficient tests. Data was analyzed for sample characteristics, descriptive statistics including means, and percentages. Chi-square analysis was used to compare the results between the two schools. Data from ordinal type questions was converted into numerical value to facilitate analysis by Mann-Whitney U tests. For questions that had nominal answer choices, descriptive statistics were calculated and Chi-square tests were used to compare responses from the two groups of students. For the open-ended question asking about age, descriptive statistics were calculated and independent sample t-tests were used to compare the two groups of students.

Results:

An online survey was sent to a total of 617 senior dental students at KAU and TUSDM. Only 214 students responded to the online survey, with a response rate of 34.6%. Seventy six respondents (36.7%) were TUSDM students with a response rate of 21.2%, and 131 respondents (63.3%) were KAU students with a response rate of 50.8%. The mean (SD) age of respondents was 24.85 years (3.1), 23.29 years (0.78) for students at KAU, compared to 27.5 years (3.74) for students at TUSDM ($p<0.001$) (Table 1). Seventy nine respondents were male (38.0%), and 129 respondents were female (62.0%). There were 80 female (61.1%) and 51 male (38.9%) students at KAU, compared to 49 female (64.5%) and 27 male (35.5%) students at TUSDM ($p=0.63$).

Two hundred and five students responded to the question asking about their citizenship, 127 students (61.9%) were Saudi, and 73 (35.6%) were American. The other five students were from Colombia, Egypt, India, Lebanon, and Yemen. 127 KAU students (96.9%) were Saudi, with two students from Lebanon, and Yemen. Seventy three TUSDM students (96.0%) were American, with three students from Colombia, Egypt, and India.

Ninety students (43.5%) anticipated graduating in 2012, 112 students (54.1%) anticipated graduating in 2013, and five students (2.4%) anticipated graduating in 2014. Sixty KAU students (45.8%) anticipated graduating in 2012, 67 (51.1%) anticipated graduating in 2103, and four (3.1%) anticipated graduating in 2014. Thirty TUSDM students (39.5%) anticipated graduating in 2012, 45 (59.2%) anticipated graduating in 2013, and only one student (1.3%) anticipated graduating in 2014 (Table 1).

Experiences with individuals with DD:

There were significant differences between students at KAU and students at TUSDM in their clinical and personal experiences with individuals with DD.

Clinical experience in treating individuals with DD:

Only 15 (11.6%) of the KAU students, compared to 64 (86.5%) of the TUSDM students reported treating an individual with a DD ($p<0.001$) (Table 2). Of the students who reported treating an individual with a DD, 15 of 15 (100.0%) of KAU students, compared to 39 of the 64 (60.9%) TUSDM students ($p=0.004$), reported treating between one and five individuals with DD (Table 2). None of the KAU students, compared to 25 out of 64 (39.1%) TUSDM students ($p=0.004$), reported treating more than five individuals with DD (Table 2). Students at TUSDM

significantly treated more individuals with DD, compared to students at KAU (p=0.004) (Table 2).

Only eight out of 15 (53.3%) KAU students reported providing diagnostic services, compared to 58 out of 64 (90.6%) TUSDM students (p=0.002). Only five out of 15 (33.3%) KAU students reported providing preventive dental services, compared to 57 out of 64 (89.1%) TUSDM students (p<0.001). Seven out of 15 KAU students (46.7%) and 47 out of 64 TUSDM students (73.4%), reported providing restorative dental treatment (p=0.064). Seven out of 15 KAU students (46.7%) and 15 out of 64 TUSDM students (23.4%) reported providing oral surgery (p=0.11). Only three out of 15 KAU students (20.0%) and 12 out of 64 TUSDM students (18.8%), reported providing prosthetic dental treatment (p=1.00). Only two out of 15 KAU students (13.3%) and three out of 64 TUSDM students (4.7%), reported providing root canal treatment for these individuals (p=0.24) (Figure 1).

None of KAU students, compared to 15 out of 64 (23.5%) TUSDM students (p=0.06), rated their experience in treating individuals with DD as “excellent” or “very good”. Four out of 15 (36.4%) KAU students, compared to 23 out of 64 (35.9%) TUSDM students (p=0.06), rated their experience as “good”. Seven out of 15 (63.7%) KAU students, compared to 26 out of 64 (40.6%) TUSDM students (p=0.06), rated their experience as “fair” or “poor” (Table 2).

Personal experience with individuals with DD:

Fifty five (43.7%) of the KAU students, compared to 48 (64.9%) of the TUSDM students (p=0.004), reported knowing a non-patient individual with a DD (Table 3). Students at TUSDM knew significantly more non-patient individuals with DD, compared to students at KAU (p=0.004) (Table 3). Among students who reported knowing a non-patient individual with DD:

eight (14.5%) of the KAU students, compared to 24 (50.0%) of the TUSDM students reported that, that individual was a friend; 36 (65.5%) of the KAU students, compared to 13 (27.1%) of the TUSDM students reported that, that individual was a more distant relative ($p<0.001$) (Table 3).

Education and training in treating individuals with DD:

There were significant differences between students at KAU and students at TUSDM in their education and training in the treatment of individuals with DD.

Seventy one (58.2%) of the KAU students, compared to only 10 (13.5%) of the TUSDM students ($p<0.001$), reported not having received any training in treating individuals with DD. Forty two (34.4%) of the KAU students, compared to 33 (44.6%) of the TUSDM students ($p<0.001$), reported receiving between one and five hours of training in the treatment of individuals with DD. Only nine (7.4%) of the KAU students, compared to 31 (41.9%) of the TUSDM students ($p<0.001$) reported receiving more than five hour of training in the treatment of individuals with DD. Students at TUSDM significantly received more hours of training in treating individuals with DD, compared to students at KAU ($p<0.001$) (Table 4).

Fifty six (57.1%) of the KAU students, compared to only 15 (20.3%) of the TUSDM students ($p<0.001$), reported that their education had not prepared them effectively to treat individuals with DD. Students at TUSDM were significantly more likely to report that their dental education had prepared them effectively to treat individuals with DD, compared to students at KAU ($p<0.001$) (Table 4).

Ninety two (92.0%) of the KAU students, compared to 56 (76.7%) of the TUSDM students ($p=0.005$), wanted more education and training in the treatment individuals with DD

(Table 4). Students at KAU were more likely to request more education and training in the treatment of individuals with DD, compared to students at TUSDM (p=0.005). Only two (2.2%) of the KAU students, and two (3.4%) of the TUSDM students wanted only didactic education. Thirty six (38.7%) of the KAU students, and 25 (43.1%) of the TUSDM students wanted only clinical training. Fifty five (59.1%) of the KAU students, and 31 (53.4%) of the TUSDM wanted both didactic and clinical education in the treatment of individuals with DD (p=0.467) (Table 4).

Attitudes toward individuals with DD:

In order to compare the attitudes of students at KAU and TUSDM, they were asked to report how they agreed or disagreed with specific statements regarding their educational experiences concerning individuals with DD, their perception of their instructors, their interpersonal and future interactions with individuals with DD.

A: Educational experiences:

There were significant differences between students at KAU and students at TUSDM in how they responded to the statements regarding their educational experiences concerning individuals with DD. As shown below, more TUSDM students strongly agreed or agreed with these statements, compared to KAU students.

Only 21 (17.0%) of the KAU students, compared to 37 (53.6%) of the TUSDM students (p<0.001), “strongly agreed” or “agreed” that their education had taught them to enjoy treating individuals with DD (Table 5). Only nine (7.4%) of the KAU students, compared to 34 (48.6%) of the TUSDM students (p<0.001), “strongly agreed” or “agreed” that their educational experiences had helped them enjoy being with individuals with DD (Table 5). Only 15 (12.3%) of the KAU students, compared to 38 (55.1%) of the TUSDM students (p<0.001), “strongly

agreed" or "agreed" that their educational experiences had helped them interact with individuals with DD (Table 5).

Twenty one (17.2%) of the KAU students, compared to 32 (47.1%) of the TUSDM students ($p<0.001$), "strongly agreed" or "agreed" that their educational experiences had taught them a tremendous amount about the dental needs of individuals with DD (Table 6). Sixteen (13.1%) of the KAU students, compared to 28 (41.2%) of the TUSDM students ($p<0.001$), "strongly agreed" or "agreed" that their educational training had made them confident to treat individuals with DD (Table 6). Eight (6.6%) of the KAU students, compared to 25 (36.2%) of the TUSDM students ($p<0.001$), "strongly agreed" or "agreed" that the program for the treatment of individuals with DD at their school was really good (Table 6).

B: Perception of instructors:

There were significant differences between students at KAU and students at TUSDM in how they responded to attitude statements regarding their perception of their instructors' training in the treatment of individuals with DD. As shown below, more TUSDM students "strongly agreed" or "agreed" with the two positive statements regarding their instructors, compared to KAU students. Moreover, more TUSDM students "strongly disagreed" or "disagreed" with the two negative statements regarding their instructors, compared to KAU students.

Only 14 (11.4%) of the KAU students, compared to 34 (49.2%) of the TUSDM students ($p<0.001$), "strongly agreed" or "agreed" that their teachers had shown them how to enjoy treating individuals with DD (Table 7). Twenty three (18.8%) of the KAU students, compared to 32 (46.4%) of the TUSDM students ($p<0.001$), "strongly agreed" or "agreed" that their teachers demonstrated enthusiasm about treating individuals with DD (Table 7).

Only twenty three (18.7%) of the KAU students, compared to 31 (44.3%) of the TUSDM students ($p<0.001$), "strongly disagreed" or "disagreed" that their teachers have not shown them how to respond to the needs of individuals with DD (Table 8). Thirty five (28.7%) of the KAU students, compared to 38 (54.3%) of the TUSDM students ($p=0.001$), "strongly disagreed" or "disagreed" that their instructors seemed nervous or reluctant to treat individuals with DD (Table 8).

C: Interpersonal and future interactions with individuals with DD:

There were no significant differences between students at KAU and students at TUSDM in how they responded to two of the seven statements regarding their interactions with individuals with DD. However, there were significant differences between the two groups of students in how the responded to the other five statements.

105 (85.4%) of the KAU students and 68 (97.1%) of the TUSDM students ($p=0.096$), "strongly agreed" or "agreed" that they care about the future dental treatment of individuals with DD (Table 9). Only 12 (9.8%) of the KAU students and only one (1.4%) of the TUSDM students ($p=0.261$), "strongly agreed" or "agreed" that they were not interested in learning anything else about individuals with DD (Table 9). There were no significant differences between KAU and TUSDM students' responses to these two statements.

Only 14 (11.7%) of the KAU students, compared to 32 (46.3%) of the TUSDM students ($p=0.001$), "strongly disagreed" or "disagreed" that they found it difficult to respond to individuals with DD during dental treatment (Table 10). Thirty one (25.4%) of the KAU students, compared to 44 (63.8%) of the TUSDM students ($p<0.001$), "strongly disagreed" or "disagreed" that the treatment of individuals with DD is very discouraging (Table 10).

Fifty six (45.9%) of the KAU students, compared to 47 (67.2%) of the TUSDM students ($p=0.047$), "strongly disagreed" or "disagreed" that they would not desire individuals with DD in their practice (Table 11). Sixty five (53.3%) of the KAU students, compared to 69 (98.6%) of the TUSDM students ($p<0.001$), "strongly disagreed" or "disagreed" that the more severe the DD, the lesser the need for restorative dentistry (Table 11). Forty two (34.4%) of the KAU students, compared to 60 (85.7%) of the TUSDM students ($p<0.001$), "strongly disagreed" or "disagreed" that dental services for individuals with DD should only be provided in a hospital (Table 11).

There were significant differences between KAU and TUSDM students' responses to five of the seven statements in this section. More TUSDM students strongly disagreed or disagreed with these negative statements, compared to KAU students ($p<0.05$).

Students' concerns and interest:

The top concerns reported by students at KAU and TUSDM, in providing dental treatment to individuals with DD, were: 1) patient behavior (40.6%), reported by 40 (32.8%) of the KAU students, compared to 38 (54.3%) of the TUSDM students; 2) their level of training (28.1%), reported by 38 (31.1%) of the KAU students, compared to 16 (22.9%) of the TUSDM students; 3) patients' level of disability (17.7%), reported by 26 (21.3%) of the KAU students, compared to eight (11.4%) of the TUSDM students; 4) level of dental disease (6.8%), reported by seven (5.7%) of the KAU students and six (8.6%) of the TUSDM students (Figure 2).

There was no significant difference between KAU students and TUSDM students in their interest in providing dental care to individuals with DD. Ninety five (77.9%) of the KAU students, and 60 (85.7%) of the TUSDM students ($p=0.19$), reported that they were interested in providing dental care to individuals with DD as a part of their career (Table 12). However, more

KAU students reported that they do not have the proper training to treat individuals with DD. More than three quarters of the KAU students (78.2%), compared to 41.1% of the TUSDM students ($p<0.001$), "strongly agreed" or "agreed" that they would like to provide dental treatment to individuals with DD, but do not have the proper training (Table 12).

Association between education and experience:

Students who reported receiving training in the treatment of individuals with DD, were more likely to report treating an individual with a DD, compared to students who reported not receiving any training in the treatment of individuals with DD ($p<0.001$). Moreover, students who reported that their education had prepared them to treat individuals with DD, were more likely to report treating an individual with a DD ($p<0.001$).

There was a positive correlation between the number of hours of training students received, and the number of individuals with DD students treated. The higher the number of hours of training students received, the higher the number of individuals with DD they treated ($p=0.002$). There was also a positive correlation between the number of hours of training students received and how the rated their experience in treating individuals with DD. The higher the number of hours of training students received, the higher they rated their experience in treating individuals with DD ($p<0.001$)

Association between experience and interest:

Students who reported knowing a non-patient individual with a DD, were more likely to report treating an individual with a DD ($p<0.001$). Students who reported treating an individual with a DD, significantly rated their experience in treating individuals with DD higher, compared to students who did not report treating an individual with a DD ($p<0.001$). Moreover, students

who reported treating an individual with a DD, were more likely to report being interested in providing dental care to individuals with DD as a part of their career, compared to students who reported not treating an individual with a DD (p=0.041).

Association between experience and attitudes:

A: Clinical experience:

There were significant differences between students who reported treating individuals with DD, and students who did not, in how they responded to five of the seven statements regarding their interpersonal and future interactions with individuals with DD. As shown below, students who reported treating these individuals were more likely to "strongly disagree" or "disagree" with these five statements, compared to students who reported not treating any individual with a DD.

Only 11 (9.7%) of the students who reported not treating any individuals with DD, compared to 35 (46.7%) of the students who did (p=0.002), "strongly disagreed" or "disagreed" that when treating individuals with DD, they found it difficult to respond to them (Table 14). Only 28 (24.1%) of the students who reported not treating any individuals with DD, compared to 47 (62.7%) of the students who did (p<0.001), "strongly disagreed" or "disagreed" that the dental treatment of individuals with DD is very discouraging (Table 14).

Fifty one (43.6%) of the students who reported not treating any individuals with DD, compared to 52 (69.3%) of the students who did (p=0.025), "strongly disagreed" or "disagreed" that they would not particularly desire individuals with DD in their practice (Table 15). Sixty eight (57.6%) of the students who reported not treating any individuals with DD, compared to 66 (89.2%) of the students who did (p<0.001), "strongly disagreed" or "disagreed" that the more

severe the DD the lesser the need for restorative dentistry (Table 15). Only 41 (35.1%) of the students who reported not treating any individuals with DD, compared to 61 (81.3%) of the students who did ($p<0.001$), "strongly disagreed" or "disagreed" that dental services for individuals with DD should only be provided in a hospital (Table 15).

There was a positive correlation between how many individuals with DD students treated, and how positive were their responses to five of the attitudes statements regarding their interpersonal and future interactions with individuals with DD. The higher the number of individuals with DD students treated, the more positive their attitudes were toward interpersonal and future interactions with individuals with DD ($p<0.05$).

B: Personal experience:

There were significant differences between students who reported knowing a non-patient individual with a DD and students who did not, in how they responded to five of the seven statements regarding their interpersonal and future interactions with individuals with DD. As shown below, students who reported knowing a non-patient individual with a DD were more likely to "strongly agree" or "agree" with the positive statement, and "strongly disagree" or "disagree" with the negative statements, compared to students who reported not knowing any non-patient individual with a DD.

Seventy eight (84.8%) of the students who reported not knowing any non-patient individual with a DD, compared to 94 (94.9%) of the students who did ($p<0.001$), "strongly agreed" or "agreed" that they care about the future dental treatment of individuals with DD (Table 16). Only 27 (29.7%) of the students who reported not knowing any non-patient individual with a DD, compared to 48 (49.0%) of the students who did ($p=0.032$), "strongly

disagreed" or "disagreed" that the dental treatment of individuals with DD is very discouraging (Table 17).

Only 42 (45.7%) of the students who reported not knowing any non-patient individual with a DD, compared to 61 (62.2%) of the students who did (p=0.017), "strongly disagreed" or "disagreed" that they would not particularly desire any individuals with DD in their practice (Table 18). Only 55 (59.7%) of the students who reported not knowing any non-patient individual with a DD, compared to 78 (79.6%) of the students who did (p=0.001), "strongly disagreed" or "disagreed" that the more severe the DD the lesser the need for restorative dentistry (Table 18). Only 37 (40.7%) of the students who reported not knowing any non-patient individual with a DD, compared to 65 (65.7%) of the students who did (p=0.002), "strongly disagreed" or "disagreed" that dental services for individuals with DD should only be provided in a hospital (Table 18).

Association between education and attitudes:

A: Educational experiences:

There were significant differences between students who reported being prepared by their education to treat individuals with DD, and students who did not in how they responded to the attitude statements regarding their educational experiences in treating individuals with DD. As shown below, students who reported being prepared to treat individuals with DD were more likely to "strongly agree" or "agree" with these statements, compared to students who reported not being prepared to treat individuals with DD.

Only ten (14.3%) of the students who reported not being prepared to treat individuals with DD, compared to 25 (61.0%) of the students who reported being prepared (p<0.001),

"strongly agreed" or "agreed" that their education had taught them to enjoy treating individuals with DD (Table 19). Only nine (12.7%) of the students who reported not being prepared to treat individuals with DD, compared to 23 (56.1%) of the students who reported being prepared ($p<0.001$), "strongly agreed" or "agreed" that their educational experiences had helped them enjoy being with individuals with DD (Table 19). Only eight (11.4%) of the students who reported not being prepared to treat individuals with DD, compared to 30 (73.2%) of the students who reported being prepared ($p<0.001$), "strongly agreed" or "agreed" that their educational experiences had helped them interact with individuals with DD (Table 19).

Only seven (10.0%) of the students who reported not being prepared to treat individuals with DD, compared to 23 (57.5%) of the students who reported being prepared ($p<0.001$), "strongly agreed" or "agreed" that their educational experiences had taught them a tremendous amount about the dental needs of individuals with DD (Table 20). Only five (7.0%) of the students who reported not being prepared to treat individuals with DD, compared to 29 (74.3%) of the students who reported being prepared ($p<0.001$), "strongly agreed" or "agreed" that their educational training had made them confident to treat individuals with DD (Table 20). Only three (4.3%) of the students who reported not being prepared to treat individuals with DD, compared to 22 (53.7%) of the students who reported being prepared ($p<0.001$), "strongly agreed" or "agreed" that the program for the treatment of individuals with DD at their school was really good (Table 20).

There was a positive correlation between the how many hours of training students received in treating individuals with DD, and how they responded to the attitude statements regarding their educational experiences in treating individuals with DD. The higher the number

of hours students received, the more positive their attitudes were toward their educational experiences in treating individuals with DD ($p<0.001$).

B: Perception of instructors:

There were significant differences between students who reported being prepared to treat individuals with DD, and students who did not in their responses to the attitudes statements regarding their perception of their instructors. As shown below, students who reported being prepared were more likely to "strongly agree" or "agree" with the two positive statements, and "strongly disagree" or "disagree" with the two negative statements, compared to students who reported not being prepared to treat individuals with DD.

Only seven (9.9%) of the students who reported not being prepared to treat individuals with DD, compared to 23 (57.5%) of the students who reported being prepared ($p<0.001$), "strongly agreed" or "agreed" that their teachers had shown them how to enjoy treating individuals with DD (Table 21). Only 14 (20.0%) of the students who reported not being prepared to treat individuals with DD, compared to 19 (47.5%) of the students who reported being prepared ($p<0.001$), "strongly agreed" or "agreed" that their teachers demonstrated enthusiasm about treating individuals with DD (Table 21).

Only nine (12.7%) of the students who reported not being prepared to treat individuals with DD, compared to 25 (61.0%) of the students who reported being prepared ($p<0.001$), "strongly disagreed" or "disagreed" that their teachers had not shown them how to respond to the needs of individuals with DD (Table 22). Only 17 (23.9%) of the students who reported not being prepared to treat individuals with DD, compared to 25 (62.5%) of students who reported

being prepared ($p=0.001$), “strongly disagreed” or “disagreed” that their instructors seemed nervous and reluctant to treat individuals with DD (Table 22).

There was a positive correlation between how many hours of training students received in the treatment of individuals with DD, and how they responded to the attitude statements regarding their instructors. The higher the number of hours students received in the treatment of individuals with DD, the more positive their attitudes were toward their instructors’ training in the treatment of individuals with DD ($p<0.05$).

Discussion:

We compared the attitudes of senior dental students at KAU and TUSDM, toward providing oral health care services to individuals with DD. We aimed to determine if there was a difference in the attitudes between the two groups of students. We also aimed to determine if there was an association between pre-doctoral training and having a positive attitude toward providing oral health care to individuals with DD.

There were significant differences in the attitudes between students at KAU and students at TUSDM. Students at TUSDM had more positive attitudes toward their educational experiences with individuals with DD, their perception of their instructors training in the treatment of individuals with DD, and their interpersonal and future interactions with individuals with DD compared to KAU students.

These differences in the attitudes may be attributed to the significant differences in students’ experiences in treating individuals with DD at both schools. Only 11.6% of KAU

students reported treating an individual with a DD, compared to 86.5% of TUSDM students. The differences in the attitudes between students at KAU and students at TUSDM may be attributed to the significant differences in education and training students receive at both schools. More than half of KAU students (58.2%) reported not receiving any training in the treatment of individuals with DD, compared to only 13.5% of TUSDM students. More than half of KAU students (57.1%) reported that their dental education had not prepared them effectively to treat individuals with DD, compared to 20.3% of TUSDM students. Moreover, 92.0% of KAU students reported wanting more education in the treatment of individuals with DD, compared to 76.6% of TUSDM students.

In this study we also found that students who reported treating an individual with a DD, had more positive attitudes toward their interpersonal and future interactions with individuals with DD, compared to students who reported not treating any individuals with DD. Moreover, the higher the number of individuals with DD students treated the more positive their attitudes were toward interpersonal and future interactions with individuals with DD. A previous study supports these findings, it found that the more experience dental students had with individuals with ID, the more positive their attitudes were toward individuals with ID.[30]

Students who reported being prepared to treat individuals with DD had more positive attitudes toward their educational experiences and their instructors' training in the treatment of individuals with DD, compared to students who were not prepared to treat these individuals. Moreover, the higher the number of hours of training students received in the treatment of individuals with DD, the more positive their attitudes were toward their educational experiences and their perception of their instructors' training in the treatment of individuals with DD. A previous study reported that the more education dentists received in treating individuals with

special needs, and the more they felt prepared to treat these individuals, the more positive their attitudes were toward providing dental treatment to individuals with special needs.[23]

In this study we found that 77.9% of KAU students and 85.7% of TUSDM students were interested in providing care for individuals with DD as a part of their careers. However, 78.2% of KAU students and 41.1% of TUSDM strongly agreed or agreed that they do not have the proper training. This finding is similar to a previous study, where 83% of students indicated that they would provide dental care to individuals with ID in their career, but 74.6% reported that they were not well prepared to treat individuals with intellectual disabilities.[30]

When students were asked about their primary concern in providing dental care to individuals with DD, the highest reported concerns were: patient behavior; their level of training; patient's level of disability; and level of dental disease. This finding is similar to the finding of a previous study, where dentists reported: patient behavior; level of patients' disability; their level of training; and level of dental disease as the highest barriers to treat children with special needs.[22] In other studies, dentists have also reported their level of training[25, 26, 27] as a barrier in treating individuals with disabilities.

Millions of individuals with DD live in our communities and are dependent on the services of community dental care providers. Dentists need to broaden their perception of the community to include individuals with DD. There are many factors that could influence the decision of future dentists to provide oral health care to individuals with DD. However, if future dentists were provided with the needed knowledge to manage the oral problems, they may have positive attitudes toward providing care for these individuals. Having positive attitudes and

interest in treating individuals with DD may help future dentists overcome barriers they face while treating this population.

Our study has a number of limitations: 1) we surveyed a convenience sample, which may not be representative of dental students in Saudi Arabia and the United States; 2) the low response rate to the survey, which may be attributed to the length of the questionnaire, and sending it via email; 3) our data is based on memory recall of dental students, which may have resulted in some errors; 4) the survey instrument did not ask students about financial barriers; 5) the test retest reliability tests were done over a short period of time, which may have affected the internal validity of the survey instrument. On the positive side, this study is the first to survey the attitudes of dental students in Saudi Arabia toward providing dental care to individuals with DD. It is also the first to compare the attitudes of dental students in Saudi Arabia and the United States toward providing dental care to individuals with DD. Future research is needed to assess the amount of education and training provided by Saudi dental schools in the treatment of individuals with DD. It is important to also study the effects of cultural and financial factors on the attitudes and interests of dental students in providing dental care to individuals with DD.

This study was conducted in an effort to identify deficiencies in dental students' experiences and education in the treatment of individuals with DD. Identifying these deficiencies may help determine the need to implement effective pre-doctoral dental programs for treating individuals with DD in Saudi dental schools. Dental schools across Saudi Arabia may be receptive to develop more curricular programs to prepare future dental practitioners to treat individuals with special needs, including those with DD.

Conclusions:

Within the limitations of our study, we can conclude that there were significant differences in the attitudes between students at KAU and students at TUSDM. TUSDM students had more positive attitudes toward providing oral health care to individuals with DD. We also can conclude that there is an association between pre-doctoral training in the treatment of individuals with special needs and having positive attitudes toward providing dental care to individuals with DD.

References:

1- U.S. Department of Health and Human Services, Oral Health in America: A report of The Surgeon General Rockville, MD: US Department of Health and Human Services, National Institutes of Dental and Craniofacial Research, National Institutes of Health, 2000.

2- AlSarheed M, Bedi R, Hunt NP: Attitudes of dentists, working in Riyadh, toward people with a sensory impairment, Special Care Dentist 2001;21(3):113-116.

3- AlSarheed M, Bedi R, Alkhatib MN, Hunt NP: Dentists' Attitudes and Practices Toward Provision of Orthodontic Treatment for Children with Visual and Hearing Impairments, Special Care Dentist 2006;26(1):30-36.

4- United Nations. World program of action concerning disabled persons. [www.document] URL http://www.un.org/esa/socdev/enable/diswpa01.htm [accessed June 2011].

5- Developmental Disabilities Act, section 102(8). [www.document]. URLhttp://www.md-council.org/resources/dd_definition.html [accessed December 2011].

6- Centers of Disease Control and Prevention. [www.document]. URLhttp://www.cdc.gov/ncbddd/developmentaldisabilities/facts.html [accessed April 2013].

7- Boyle CA, Boulet S, Schieve LA, Cohen RA, Blumberg SJ, Allsopp MY, Visser S, Kogan MD. Trends in the Prevalence of Developmental Disabilities in US Children, 1997-2008. Pediatrics 2011;127:1034-1042.

8- Morgan JP, Minihan PM, Stark PC, Finkelman MD, Yantsides KE, Park A, Nobles CJ, Tao W, Must A. The oral health status of 4,732 adults with intellectual and developmental disabilities. JADA 2012;143(8):838-846.

9- Anders PL, Davis EL. Oral health of patients with intellectual disabilities: a systematic review. Spec Care Dent 2010;30(3):110-117.

10- U.S. Department of Health and Human Services, Closing The Gap: A Report of The Surgeons General's Conference on Health Disparities and Mental Retardation. Rockville, MD: US Department of Health and Human Services, Public Health Service,

2002.

11- J. C. Harris, *Intellectual Disability: Understanding its Development, Causes, Classification, Evaluation, and Treatment*, Oxford University Press, New York, NY, USA, 2006. [www.document] [Accessed: December 2012].

12- Americans with Disabilities Act of 1990. [www.document] URL: http://www.ada.gov/pubs/ada.htm [Accessed December 2012]

13- Olmstead v. L.C. Legal Information Institute. Supreme Court of the United States. 22 June 1999. [www.document] URL: http://www.acf.hhs.gov/programs/aidd/resource/olmstead-settlement-agreement-in-virginia [Accessed December 2012]

14- Fenton SJ, Hood H, Holder M, May PB Jr, Mouradian WE. The American Academy of Developmental Medicine and Dentistry: eliminating health disparities for individuals with mental retardation and other developmental disabilities. J Dent Educ 2003; 67(12)1337- 1344.

15- US Census Bureau, *Review of Changes to the Measurment of Disability in the 2008 American Community Survey*, Washington, DC, USA.

16- Prater CD and Zylstra RG. "Medical care for adults with mental retardation", *American Family Physician*, vol. 73, no. 12, pp. 2175-2183, 2006.

17- Janicki MP, Dalton AJ, Henderson CM, Davidson PM. Mortality and morbidity among older adults with intellectual disability: health service considerations. Disability Rehabil 1999;21:284-294

18- The national Association of Down Syndrome. [a www.document] Fact Sheet at: www.nads.org/pages/facts.htm. [Accessed: October 20, 2011].

19- Waldman HB, Perlman SP. Children with disabilities are aging out of dental care. ASDC J Dent Child 1997;64(6): 385-390.

20- Havercamp SM, Scandlin D, Roth M. Health Disparities Among Adults with Developmental Disabilities, Adults with Other Disabilities, and Adults Not Reporting Disability in North Carolina. Public Health Reports 2004;119:418-426.

21- Seirawan H, Schneiderman J, Greene V, Mulligan R. Interdisciplinary approach to oral health for persons with developmental disabilities. Spec Care Dent 2008;28(2)43-51.

22- Casamassimo PS, Seale NS, Rueshs K. General Dentists' Perceptions of Educational and Treatment Issues Affecting Access to Care for Children with Special Health Care Needs. J Dent Edu 2004;68: 23-28.

23- Dao LP, Zwetchkenbaum S, Inglehart MR. General Dentists and Special Needs Patients: Does Dental Education Matter? J Dent Edu 2005;69(10):1107-1115.

24- U.S. Department of Health and Human Services. The Surgeon General's Call to Action to Improve the Health and Wellness of Persons with Disabilities. U.S. Department of Health and Human Services, Office of the Surgeon General, 2005.

25- Jongh AD, Houtem CV, Schoof MV, Resida G , Broers D. Oral health status, treatment needs, and obsticles to dental care among noninstitutionalized children with severe mental disabilities in The Netherlands. Spec Care Dentist 2008;28(3): 111-115.

26- Gizani S, Kandilorou H, Kavvadia K, Tzoutzas J. Oral health care provided by Greek dentists to persons with physical and/or intellectual impairment. Spec Care Dentist 2012;32(3):83-89.

27- Tsai WC, Kung PT, Chiang HH, Chang WC. Changes and factors associated with dentist's willingness to treat patients with severe disabilities. Health Policy 2007;83:363-374.

28- Fenton SJ. 1993 survey of training in the treatment of persons with disabilities. InterFace 1993; 9:1,4.

29- Romer M, Dougherty N, Amore-Lafleur E. Predoctoral education in special care dentistry: paving the way to better access? ASDC J Dent Child 1999;66(2):132-5, 85.

30- Wolff AJ, Waldman HB, Milano M, Perlman SP. Dental students' experiences with and attitudes toward people with mental retardation. J Am Dent Assoc 2004;135:353-357.

31- DeLucia LM, Davis EL. Dental Students' Attitudes Toward the Care of Individuals with Intellectual Disabilities: Relationship Between Instruction and Experience. J Dent Edu 2009;73(4):445-453.

32- Cecillia E. Aragon, Tiiu Hess, Jorge G. Burneo. Knowledge and Attitudes about Epilepsy: A Survey of Dentists in London, Ontario. JCDA 2009;Vol. 75. July/August.

33- Cynthia C. Dabed, Doris L. Cauvi. Survey of Dentists' Experiences with Cleft Palate Children in Chile. Cleft Palate-Craniofacial Journal, Vol. 35 no. 5, September 1998.

34- Lee MM, Sonis AL. An instrument to assess dental students' attitudes toward the handicapped. Spec Care Dent. 1983; 3(2):117-23.

Table 1. Demographic characteristics of respondents. *					
Category	Choices	KAU, n (%)	TUSDM, n (%)	Total, n (%)	p-value
Age Mean (SD)	NA[¶]	23.3 (0.78)	27.5 (3.74)	24.8 (3.10)	<0.001[§]
Gender	Female	80 (61.1)	49 (64.5)	129 (62.0)	0.63[†]
	Male	51 (38.9)	27 (35.5)	79 (38.0)	
Citizenship	American	0	73 (96.0)	73 (36.5)	<0.001[‡]
	Saudi	127 (96.9)	0	127 (63.5)	
	Colombian	0	1 (1.3)	1 (0.5)	
	Egyptian	0	1 (1.3)	1 (0.5)	
	Indian	0	1 (1.3)	1 (0.5)	
	Lebanese	1 (0.8)	0	1 (0.5)	
	Yemeni	1 (0.8)	0	1 (0.5)	
Year of graduation	2012	60 (45.8)	30 (39.5)	90 (43.5)	0.47[‡]
	2013	67 (51.1)	45 (59.2)	112 (54.1)	
	2014	4 (3.1)	1 (1.3)	5 (2.4)	
Total	NA[¶]	131 (63.3)	76 (36.7)	207 (100.0)	NA[¶]

*Percentages reported are valid percentages, excluding missing data.
§p-value derived from an independent sample t-test.
†p-value derived from a Chi-square test.
‡p-values derived from Fisher exact tests.
¶NA: Not applicable.

Table 2. A comparison of students' experiences in treating individuals with DD. *					
Category	Choices	KAU, n (%)	TUSDM, n (%)	Total, n (%)	p-value
Treated an individual with a DD.	Yes	15 (11.6)	64 (86.5)	79 (38.9)	<0.001†
	No	114 (88.4)	10 (13.5)	124 (61.1)	
Number of individuals with DD treated during your dental training. **	1-5	15 (100.0)	39 (60.9)	54 (68.4)	0.004‡
	6-10	0	15 (23.4)	15 (19.0)	
	>10	0	10 (15.6)	10 (12.6)	
Rating their experience in treating individuals with DD. **	Excellent	0	3 (4.7)	3 (4.0)	0.06‡
	Very good	0	12 (18.8)	12 (16.0)	
	Good	4 (36.4)	23 (35.9)	27 (36.0)	
	Fair	5 (45.5)	21 (32.8)	26 (34.7)	
	Poor	2 (18.2)	5 (7.8)	7 (9.3)	
Total	NA¶	131 (63.3)	76 (36.7)	207 (100.0)	NA¶

*Percentages reported are valid percentages, excluding missing data.
**Percentages are based on the number of students who treated individuals with DD (n=79).
†p-value derived from a Chi-square test.
‡p-values derived from Mann-Whitney U tests.
¶NA: Not applicable.

Table 3. A comparison of students' personal experiences with individuals with DD. *					
Category	Choices	KAU, n (%)	TUSDM, n (%)	Total, n (%)	p-value
Know an individual with a DD other than a patient.	Yes	55 (43.7)	48 (64.9)	103 (51.5)	0.004†
	No	71 (56.3)	26 (35.1)	97 (48.5)	
That individual is a:	Friend	8 (14.5)	24 (50.0)	32 (31.1)	<0.001†
	Neighbor	3 (5.5)	8 (16.7)	11 (10.7)	
	Immediate family member	8 (14.5)	3 (6.3)	11 (10.7)	
	More distant relative	36 (65.5)	13 (27.1)	49 (47.6)	
Total	NA¶	131 (63.3)	76 (37.6)	207 (100.0)	NA¶
*Percentages reported are valid percentages, excluding missing data. †p-values derived from Chi-square tests. ¶NA: Not applicable.					

Table 4. A comparison of students' education and training in the treatment of individuals with DD. *					
Category	Choices	KAU, n (%)	TUSDM, n (%)	Total, n (%)	p-value
Number of hours of training in managing the dental needs of individuals with DD.	0	71 (58.2)	10 (13.5)	81 (41.3)	<0.001†
	1-5	42 (34.4)	33 (44.6)	75 (38.3)	
	6-10	5 (4.1)	9 (12.2)	14 (7.1)	
	>10	4 (3.3)	22 (29.7)	26 (13.3)	
Has your dental education prepared you to effectively treat individuals with DD?	Yes	15 (15.3)	29 (39.2)	44 (25.6)	<0.001†
	No	56 (57.1)	15 (20.3)	71 (41.3)	
	Don't know	27 (27.6)	30 (40.5)	57 (33.1)	
Want more education concerning the treatment of individuals with DD.	Yes	92 (92.0)	56 (76.7)	148 (85.5)	0.005†
	No	8 (8.0)	17 (23.3)	25 (14.5)	
The type of education would you be interested in.	Didactic	2 (2.2)	2 (3.4)	4 (2.6)	0.45†
	Clinical	36 (38.7)	25 (43.1)	61 (40.4)	
	Both	55 (59.1)	31 (53.4)	86 (57.0)	
Total	NA¶	131 (63.3)	76 (36.7)	207 (100.0)	NA¶

*Percentages reported are valid percentages, excluding missing data.
†p-values derived from Chi-square tests.
¶NA: Not applicable.

Table 5. A comparison of students' responses to attitude statements regarding their educational experiences in treating individuals with DD. *

Statements	Choices	KAU, n (%)	TUSDM, n (%)	Total, n (%)	p-value†
"My education has taught me to enjoy treating individuals with DD"	Strongly agree	2 (1.6)	10 (14.5)	12 (6.3)	<0.001
	Agree	19 (15.4)	27 (39.1)	46 (24.0)	
	Neither agree nor disagree	53 (43.1)	32 (46.4)	85 (44.3)	
	Disagree	36 (29.3)	0	36 (18.8)	
	Strongly disagree	13 (10.6)	0	13 (6.8)	
"My educational experiences have helped me enjoy being with individuals with DD"	Strongly agree	0	11 (15.7)	11 (5.7)	<0.001
	Agree	9 (7.4)	23 (32.9)	32 (16.7)	
	Neither agree nor disagree	50 (41.0)	30 (42.9)	80 (41.7)	
	Disagree	46 (37.7)	5 (7.1)	51 (26.6)	
	Strongly disagree	17 (13.9)	1 (1.4)	18 (9.4)	
"The educational experiences I have received , have really helped me interact with individuals with DD"	Strongly agree	1 (0.8)	8 (11.6)	9 (4.7)	<0.001
	Agree	14 (11.5)	30 (43.5)	44 (23.0)	
	Neither agree nor disagree	39 (32.0)	21 (30.4)	60 (31.4)	
	Disagree	48 (39.3)	8 (11.6)	56 (29.3)	
	Strongly disagree	20 (16.4)	2 (2.9)	22 (11.5)	
Total	NA¶	131 (63.3)	76 (36.7)	207 (100.0)	NA¶

*Percentages reported are valid percentages, excluding missing data.
†p-values derived from Mann-Whitney U tests.
¶NA: Not applicable.

Table 6. A comparison of students' responses to attitudes statements regarding their educational experiences in the treatment of individuals with DD. *

Statements	Choices	KAU, n (%)	TUSDM, n (%)	Total, n (%)	p-value†
"My educational experience has taught me a tremendous amount about the dental needs of individuals with DD"	Strongly agree	2 (1.6)	5 (7.4)	7 (3.7)	<0.001
	Agree	19 (15.6)	27 (39.7)	46 (24.2)	
	Neither agree nor disagree	41 (33.6)	18 (26.5)	59 (31.1)	
	Disagree	47 (38.5)	18 (26.5)	65 (34.2)	
	Strongly disagree	13 (10.7)	0	13 (6.8)	
"My educational training has made me confident to treat individuals with DD"	Strongly agree	1 (0.8)	5 (7.4)	6 (3.2)	<0.001
	Agree	15 (12.3)	23 (33.8)	38 (20.0)	
	Neither agree nor disagree	36 (29.5)	22 (32.4)	58 (30.5)	
	Disagree	51 (41.8)	16 (23.5)	67 (35.3)	
	Strongly disagree	19 (15.6)	2 (2.9)	21 (11.1)	
"The program for treatment of individuals with DD at my school is really good"	Strongly agree	0	7 (10.1)	7 (3.7)	<0.001
	Agree	8 (6.6)	18 (26.1)	26 (13.7)	
	Neither agree nor disagree	43 (35.5)	27 (39.1)	70 (36.8)	
	Disagree	47 (38.8)	16 (23.2)	63 (33.2)	
	Strongly disagree	23 (19.0)	1 (1.4)	24 (12.6)	
Total	NA¶	131 (63.3)	76 (36.7)	207 (100.0)	NA¶

*Percentages reported are valid percentages, excluding missing data.
†p-values derived from Mann-Whitney U tests.
¶NA: Not applicable.

Table 7. A comparison of students' responses to attitudes statements regarding their instructors.*

Statements	Choices	KAU, n (%)	TUSDM, n (%)	Total, n (%)	p-value†
"My teachers have shown me how to enjoy treating individuals with DD"	Strongly agree	2 (1.6)	11 (15.9)	13 (6.8)	<0.001
	Agree	12 (9.8)	23 (33.3)	35 (18.2)	
	Neither agree nor disagree	35 (28.5)	27 (39.1)	62 (32.3)	
	Disagree	51 (41.5)	6 (8.7)	57 (29.7)	
	Strongly disagree	23 (18.7)	2 (2.9)	25 (13.0)	
"My teachers really demonstrate enthusiasm about treating individuals with DD"	Strongly agree	1 (0.8)	12 (17.4)	13 (6.8)	<0.001
	Agree	22 (18.0)	20 (29.0)	42 (22.0)	
	Neither agree nor disagree	41 (33.6)	32 (46.4)	73 (38.2)	
	Disagree	40 (32.8)	4 (5.8)	44 (23.0)	
	Strongly disagree	18 (14.8)	1 (1.4)	19 (9.9)	
Total	NA¶	131 (63.3)	76 (36.7)	207 (100.0)	NA¶

*Percentages reported are valid percentages, excluding missing data.
†p-values derived from Mann-Whitney U tests.
¶NA: Not applicable.

Table 8. A comparison of students' responses to attitudes statements regarding their instructors.*

Statements	Choices	KAU, n (%)	TUSDM, n (%)	Total, n (%)	p-value†
"My teachers have not shown me how to respond to the needs of individuals with DD"	Strongly agree	18 (14.6)	2 (2.9)	20 (10.4)	<0.001
	Agree	38 (30.9)	14 (20.0)	52 (26.9)	
	Neither agree nor disagree	44 (35.8)	23 (32.9)	67 (34.7)	
	Disagree	19 (15.4)	27 (38.6)	46 (23.8)	
	Strongly disagree	4 (3.3)	4 (5.7)	8 (4.1)	
"My instructors seem nervous and reluctant to treat individuals with DD"	Strongly agree	1 (0.8)	2 (2.9)	3 (1.6)	0.001
	Agree	17 (13.9)	5 (7.1)	22 (11.5)	
	Neither agree nor disagree	69 (56.6)	25 (35.7)	94 (49.0)	
	Disagree	30 (24.6)	27 (38.6)	57 (29.7)	
	Strongly disagree	5 (4.1)	11 (15.7)	16 (8.3)	
Total	NA¶	131 (63.3)	76 (36.7)	207 (100.0)	NA¶

*Percentages reported are valid percentages, excluding missing data.
†p-values derived from Mann-Whitney U tests.
¶NA: Not applicable.

Table 9. A comparison of students' responses to attitudes statements regarding their future interactions with individuals with DD.*

Statements	Choices	KAU, n (%)	TUSDM, n (%)	Total, n (%)	p-value†
"I care about the future dental treatment of individuals with DD"	Strongly agree	54 (43.9)	36 (51.4)	90 (46.6)	0.10
	Agree	51 (41.5)	32 (45.7)	83 (43.0)	
	Neither agree nor disagree	17 (13.8)	2 (2.9)	19 (9.8)	
	Disagree	1 (0.8)	0	1 (0.5)	
	Strongly disagree	0	0	0	
"I am not interested in learning anything else about individuals with DD"	Strongly agree	0	0	0	0.26
	Agree	12 (9.8)	1 (1.4)	13 (6.7)	
	Neither agree nor disagree	18 (14.6)	16 (22.9)	34 (17.6)	
	Disagree	57 (46.3)	26 (37.1)	83 (43.0)	
	Strongly disagree	36 (29.3)	27 (38.6)	63 (32.6)	
Total	NA¶	131 (63.3)	76 (36.7)	207 (100.0)	NA¶

*Percentages reported are valid percentages, excluding missing data.
†p-values derived from Mann-Whitney U tests.
¶NA: Not applicable.

Table 10. A comparison of students' responses to attitudes statements regarding their future interactions with individuals with DD.*

Statements	Choices	KAU, n (%)	TUSDM, n (%)	Total, n (%)	p-value†
"When treating individuals with DD, I find it difficult to respond to them"	Strongly agree	5 (4.2)	1 (1.4)	6 (3.2)	0.001
	Agree	22 (18.3)	15 (21.7)	37 (19.6)	
	Neither agree nor disagree	79 (65.8)	21 (30.4)	100 (52.9)	
	Disagree	12 (10.0)	29 (42.0)	41 (21.7)	
	Strongly disagree	2 (1.7)	3 (4.3)	5 (2.6)	
"Dental treatment for individuals with DD is very discouraging"	Strongly agree	1 (0.8)	1 (1.4)	2 (1.0)	<0.001
	Agree	22 (18.0)	9 (13.0)	31 (16.2)	
	Neither agree nor disagree	68 (55.7)	15 (21.7)	83 (43.5)	
	Disagree	26 (21.3)	36 (52.2)	62 (32.5)	
	Strongly disagree	5 (4.1)	8 (11.6)	13 (6.8)	
Total	NA¶	131 (63.3)	76 (36.7)	207 (100.0)	NA¶

*Percentages reported are valid percentages, excluding missing data.
†p-values derived from Mann-Whitney U tests.
¶NA: Not applicable.

Table 11. A comparison of students' responses to attitude statements regarding their future interactions with individuals with DD.*

Statements	Choices	KAU, n (%)	TUSDM, n (%)	Total, n (%)	p-value†
"I would not particularly desire individuals with DD in my practice"	Strongly agree	2 (1.6)	0	2 (1.0)	0.047
	Agree	25 (20.5)	7 (10.0)	32 (16.7)	
	Neither agree nor disagree	39 (32.0)	16 (22.9)	55 (28.6)	
	Disagree	33 (27.0)	38 (54.3)	71 (37.0)	
	Strongly disagree	23 (18.9)	9 (12.9)	32 (16.7)	
"The more severe the DD, the lesser the need for restorative dentistry"	Strongly agree	2 (1.6)	0	2 (1.0)	<0.001
	Agree	10 (8.2)	0	10 (5.2)	
	Neither agree nor disagree	45 (36.9)	1 (1.4)	46 (24.0)	
	Disagree	42 (34.4)	34 (48.6)	76 (39.6)	
	Strongly disagree	23 (18.9)	35 (50.0)	58 (30.2)	
"Dental services for individuals with DD, should only be provided in a hospital"	Strongly agree	7 (5.7)	0	7 (3.6)	<0.001
	Agree	30 (24.6)	1 (1.4)	31 (16.1)	
	Neither agree nor disagree	43 (35.2)	9 (12.9)	52 (27.1)	
	Disagree	38 (31.1)	40 (57.1)	78 (40.6)	
	Strongly disagree	4 (3.3)	20 (28.6)	24 (12.5)	
Total	NA¶	131 (63.3)	76 (36.7)	207 (100.0)	NA¶

*Percentages reported are valid percentages, excluding missing data.
†p-values derived from Mann-Whitney U tests.
¶NA: Not applicable.

Table 12. A comparison of students' interest in providing dental care to individuals with DD.*					
Category	Choices	KAU, n (%)	TUSDM, n (%)	Total, n (%)	p-value
Are you interested in providing dental treatment to individuals with DD as a part of your career?	Yes	95 (77.9)	60 (85.7)	155 (80.7)	0.19†
	No	27 (22.1)	10 (14.3)	37 (19.3)	
"I would like to provide dental care to individuals with DD, but I do not have the proper training"	Strongly agree	40 (31.3)	8 (11.0)	48 (23.9)	<0.001‡
	Agree	60 (46.9)	22 (30.1)	82 (40.8)	
	Neither agree nor disagree	19 (14.8)	25 (34.2)	44 (21.9)	
	Disagree	8 (6.3)	17 (23.3)	25 (12.4)	
	Strongly disagree	1 (0.8)	1 (1.4)	2 (1.0)	
Total	NA¶	131 (63.3)	76 (36.7)	207 (100.0)	NA¶

*Percentages reported are valid percentages, excluding missing data.
†p-value derived from a Chi-square test.
‡p-value derived from a Mann-Whitney U test.
¶NA: Not applicable.

Table 13. A comparison of students who treated individuals with DD and students who did not in their responses to attitudes statements regarding their future interactions with individuals with DD.*

Statements	Choices	Not treated DD, n (%)	Treated DD, n (%)	Total, n (%)	p-value†
"I care about the future dental treatment of individuals with DD"	Strongly agree	52 (44.1)	38 (50.7)	90 (46.6)	0.23
	Agree	51 (43.2)	32 (42.7)	83 (43.0)	
	Neither agree nor disagree	14 (11.9)	5 (6.7)	19 (9.8)	
	Disagree	1 (0.8)	0	1 (0.5)	
	Strongly disagree	0	0	0	
"I am not interested in learning anything else about individuals with DD"	Strongly agree	0	0	0	0.24
	Agree	9 (7.6)	4 (5.3)	13 (6.7)	
	Neither agree nor disagree	22 (18.6)	12 (16.0)	34 (17.6)	
	Disagree	52 (44.1)	31 (41.3)	83 (43.0)	
	Strongly disagree	35 (29.7)	28 (37.3)	63 (32.6)	
Total	NA¶	124 (61.1)	79 (38.9)	203 (100.0)	NA¶

*Percentages reported are valid percentages, excluding missing data.
†p-values derived from Mann-Whitney U tests.
¶NA: Not applicable.

Table 14. A comparison of students who treated individuals with DD and students who did not in their responses to attitudes statements regarding their future interactions with individuals with DD.*

Statements	Choices	Not treated DD, n (%)	Treated DD, n (%)	Total, n (%)	p-value†
"When treating individuals with DD, I find it difficult to respond to them"	Strongly agree	5 (4.4)	1 (1.3)	6 (3.2)	0.002
	Agree	18 (15.8)	19 (25.3)	37 (19.6)	
	Neither agree nor disagree	80 (70.2)	20 (26.7)	100 (52.9)	
	Disagree	9 (7.9)	32 (42.7)	41 (21.7)	
	Strongly disagree	2 (1.8)	3 (4.0)	5 (2.6)	
"Dental treatment for individuals with DD is very discouraging"	Strongly agree	1 (0.9)	1 (1.3)	2 (1.0)	<0.001
	Agree	22 (19.0)	9 (12.0)	31 (16.2)	
	Neither agree nor disagree	65 (56.0)	18 (24.0)	83 (43.5)	
	Disagree	23 (19.8)	39 (52.0)	62 (32.5)	
	Strongly disagree	5 (4.3)	8 (10.7)	13 (6.8)	
Total	NA¶	124 (61.1)	79 (38.9)	203 (100.0)	NA¶

*Percentages reported are valid percentages, excluding missing data.
†p-values derived from Mann-Whitney U tests.
¶NA: Not applicable.

Table 15. A comparison of students who treated individuals with DD and students who did not in their responses to attitude statements regarding their future interactions with individuals with DD.*

Statements	Choices	Not treated DD, n (%)	Treated DD, n (%)	Total, n (%)	p-value†
"I would not particularly desire individuals with DD in my practice"	Strongly agree	2 (1.7)	0	2 (1.0)	0.025
	Agree	24 (20.5)	8 (10.7)	32 (16.7)	
	Neither agree nor disagree	40 (34.2)	15 (20.0)	55 (28.6)	
	Disagree	28 (23.9)	43 (57.3)	71 (37.0)	
	Strongly disagree	23 (19.7)	9 (12.0)	32 (16.7)	
"The more severe the DD, the lesser the need for restorative dentistry"	Strongly agree	1 (0.8)	1 (1.4)	2 (1.0)	<0.001
	Agree	8 (6.8)	2 (2.7)	10 (5.2)	
	Neither agree nor disagree	41 (34.7)	5 (6.8)	46 (24.0)	
	Disagree	43 (36.4)	33 (44.6)	76 (39.6)	
	Strongly disagree	25 (21.2)	33 (44.6)	58 (30.2)	
"Dental services for individuals with DD, should only be provided in a hospital"	Strongly agree	5 (4.3)	2 (2.7)	7 (3.6)	<0.001
	Agree	26 (22.2)	5 (6.7)	31 (16.1)	
	Neither agree nor disagree	45 (38.5)	7 (9.3)	52 (27.1)	
	Disagree	36 (30.8)	42 (56.0)	78 (40.6)	
	Strongly disagree	5 (4.3)	19 (25.3)	24 (12.5)	
Total	NA¶	124 (61.1)	79 (38.9)	203 (100.0)	NA¶

*Percentages reported are valid percentages, excluding missing data.
†p-values derived from Mann-Whitney U tests.
¶NA: Not applicable.

Table 16. A comparison of students who knew a non-patient individual with a DD and students who did not in their responses to attitudes statements regarding their future interactions with individuals with DD.*

Statements	Choices	Not know DD, n (%)	Know DD, n (%)	Total, n (%)	p-value†
"I care about the future dental treatment of individuals with DD"	Strongly agree	30 (32.6)	60 (60.6)	90 (46.6)	<0.001
	Agree	48 (52.2)	34 (34.3)	82 (42.5)	
	Neither agree nor disagree	13 (14.1)	5 (5.1)	18 (9.3)	
	Disagree	1 (1.1)	0	1 (0.5)	
	Strongly disagree	0	0	0	
"I am not interested in learning anything else about individuals with DD"	Strongly agree	0	0	0	0.08
	Agree	7 (7.6)	6 (6.1)	13 (6.7)	
	Neither agree nor disagree	19 (20.7)	14 (14.1)	33 (17.1)	
	Disagree	41 (44.6)	41 (41.4)	82 (42.5)	
	Strongly disagree	25 (27.2)	38 (38.4)	63 (32.6)	
Total	NA¶	97 (48.5)	103 (51.5)	200 (100.0)	NA¶

*Percentages reported are valid percentages, excluding missing data.
†p-values derived from Mann-Whitney U tests.
¶NA: Not applicable.

Table 17. A comparison of students who knew a non-patient individual with a DD and students who did not in their responses to attitudes statements regarding their future interactions with individuals with DD.*

Statements	Choices	Not Know DD, n (%)	Know DD, n (%)	Total, n (%)	p-value†
"When treating individuals with DD, I find it difficult to respond to them"	Strongly agree	3 (3.4)	3 (3.1)	6 (3.2)	0.26
	Agree	17 (19.1)	19 (19.4)	36 (19.1)	
	Neither agree nor disagree	52 (58.4)	47 (48.0)	99 (52.4)	
	Disagree	16 (18.0)	25 (25.5)	41 (21.7)	
	Strongly disagree	1 (1.1)	4 (4.1)	5 (2.6)	
"Dental treatment for individuals with DD is very discouraging"	Strongly agree	1 (1.1)	1 (1.0)	2 (1.0)	0.032
	Agree	14 (15.4)	16 (16.3)	30 (15.7)	
	Neither agree nor disagree	49 (53.8)	33 (33.7)	82 (42.9)	
	Disagree	24 (26.4)	38 (38.8)	62 (32.5)	
	Strongly disagree	3 (3.3)	10 (10.2)	13 (6.8)	
Total	NA¶	97 (48.5)	103 (51.1)	200 (100.0)	NA¶

*Percentages reported are valid percentages, excluding missing data.
†p-values derived from Mann-Whitney U tests.
¶NA: Not applicable.

Table 18. A comparison of students who knew a non-patient individual with a DD and students who did not in their responses to attitude statements regarding their future interactions with individuals with DD.*

Statements	Choices	Not know DD, n (%)	Know DD, n (%)	Total, n (%)	p-value†
"I would not particularly desire individuals with DD in my practice"	Strongly agree	1 (1.1)	0	1 (0.5)	0.017
	Agree	18 (19.6)	14 (14.3)	32 (16.7)	
	Neither agree nor disagree	31 (33.7)	23 (23.5)	54 (28.1)	
	Disagree	31 (33.7)	40 (40.8)	71 (37.0)	
	Strongly disagree	11 (12.0)	21 (21.4)	32 (16.7)	
"The more severe the DD, the lesser the need for restorative dentistry"	Strongly agree	1 (1.1)	1 (1.0)	2 (1.0)	0.001
	Agree	8 (8.7)	2 (2.0)	10 (5.2)	
	Neither agree nor disagree	28 (30.4)	17 (17.3)	45 (23.4)	
	Disagree	35 (38.0)	40 (40.8)	75 (39.1)	
	Strongly disagree	20 (21.7)	38 (38.8)	58 (30.2)	
"Dental services for individuals with DD, should only be provided in a hospital"	Strongly agree	4 (4.4)	3 (3.0)	7 (3.6)	0.002
	Agree	18 (19.8)	12 (12.1)	30 (15.6)	
	Neither agree nor disagree	32 (35.2)	19 (19.2)	51 (26.6)	
	Disagree	29 (31.9)	49 (49.5)	78 (40.6)	
	Strongly disagree	8 (8.8)	16 (16.2)	24 (12.5)	
Total	NA¶	97 (48.5)	103 (51.5)	200 (100.0)	NA¶

*Percentages reported are valid percentages, excluding missing data.
†p-values derived from Mann-Whitney U tests.
¶NA: Not applicable.

Table 19. A comparison of students who reported being prepared to treat individuals with DD and students who did not in their responses to attitude statements regarding their educational experiences in treating individuals with DD.*

Statements	Choices	Not prepared, n (%)	Prepared, n (%)	Total, n (%)	p-value†
"My education has taught me to enjoy treating individuals with DD"	Strongly agree	0	9 (22.0)	9 (8.1)	<0.001
	Agree	10 (14.0)	16 (39.0)	26 (23.4)	
	Neither agree nor disagree	29 (41.4)	13 (31.7)	42 (37.8)	
	Disagree	22 (31.4)	3 (7.3)	25 (22.5)	
	Strongly disagree	9 (12.9)	0	9 (8.1)	
"My educational experiences have helped me enjoy being with individuals with DD"	Strongly agree	2 (2.8)	8 (19.5)	10 (8.9)	<0.001
	Agree	7 (9.9)	15 (36.6)	22 (19.6)	
	Neither agree nor disagree	24 (33.8)	12 (29.3)	36 (32.1)	
	Disagree	27 (38.0)	6 (14.6)	33 (29.5)	
	Strongly disagree	11 (15.5)	0	11 (9.8)	
"The educational experiences I have received , have really helped me interact with individuals with DD"	Strongly agree	1 (1.4)	7 (17.1)	8 (7.2)	<0.001
	Agree	7 (10.0)	23 (56.1)	30 (27.0)	
	Neither agree nor disagree	18 (25.7)	8 (19.5)	26 (23.4)	
	Disagree	30 (42.9)	3 (7.3)	33 (29.7)	
	Strongly disagree	14 (20.0)	0	14 (12.6)	
Total	NA¶	71 (61.7)	44 (38.3)	115 (100.0)	NA¶

*Percentages reported are valid percentages, excluding missing data.
†p-values derived from Mann-Whitney U tests.
¶NA: Not applicable.

Table 20. A comparison of students who reported being prepared to treat individuals with DD and students who did not in their responses to attitudes statements regarding their educational experiences in the treatment of individuals with DD.*

Statements	Choices	Not prepared, n (%)	Prepared, n (%)	Total, n (%)	p-value†
"My educational experience has taught me a tremendous amount about the dental needs of individuals with DD"	Strongly agree	0	5 (12.5)	5 (4.5)	<0.001
	Agree	7 (10.0)	18 (45.0)	25 (22.7)	
	Neither agree nor disagree	17 (24.3)	12 (30.0)	29 (26.4)	
	Disagree	36 (51.4)	5 (12.5)	41 (37.3)	
	Strongly disagree	10 (14.3)	0	10 (9.1)	
"My educational training has made me confident to treat individuals with DD"	Strongly agree	0	5 (12.8)	5 (4.5)	<0.001
	Agree	5 (7.0)	24 (61.5)	29 (26.4)	
	Neither agree nor disagree	19 (26.8)	7 (17.9)	26 (23.6)	
	Disagree	34 (47.9)	3 (7.7)	37 (33.6)	
	Strongly disagree	13 (18.3)	0	13 (11.8)	
"The program for treatment of individuals with DD at my school is really good"	Strongly agree	0	5 (12.2)	5 (4.5)	<0.001
	Agree	3 (4.3)	17 (41.5)	20 (18.0)	
	Neither agree nor disagree	25 (35.7)	14 (34.1)	39 (35.1)	
	Disagree	25 (35.7)	5 (12.2)	30 (27.0)	
	Strongly disagree	17 (24.3)	0	17 (15.3)	
Total	NA¶	71 (61.7)	44 (38.3)	115 (100.0)	NA¶

*Percentages reported are valid percentages, excluding missing data.
†p-values derived from Mann-Whitney U tests.
¶NA: Not applicable.

Table 21. A comparison of students who reported being prepared to treat individuals with DD and students who did not in their responses to attitudes statements regarding their instructors.*

Statements	Choices	Not prepared, n (%)	Prepared, n (%)	Total, n (%)	p-value†
"My teachers have shown me how to enjoy treating individuals with DD"	Strongly agree	1 (1.4)	9 (22.5)	10 (9.0)	<0.001
	Agree	6 (8.5)	14 (35.0)	20 (18.0)	
	Neither agree nor disagree	21 (29.6)	10 (25.0)	31 (27.9)	
	Disagree	28 (39.4)	7 (17.5)	35 (31.5)	
	Strongly disagree	15 (21.1)	0	15 (13.5)	
"My teachers really demonstrate enthusiasm about treating individuals with DD"	Strongly agree	3 (4.3)	7 (17.5)	10 (9.1)	<0.001
	Agree	11 (15.7)	12 (30.0)	23 (20.9)	
	Neither agree nor disagree	22 (31.4)	16 (40.0)	38 (34.5)	
	Disagree	20 (28.6)	5 (12.5)	25 (22.7)	
	Strongly disagree	14 (20.0)	0	14 (12.7)	
Total	NA¶	71 (61.7)	44 (38.3)	115 (100.0)	NA¶

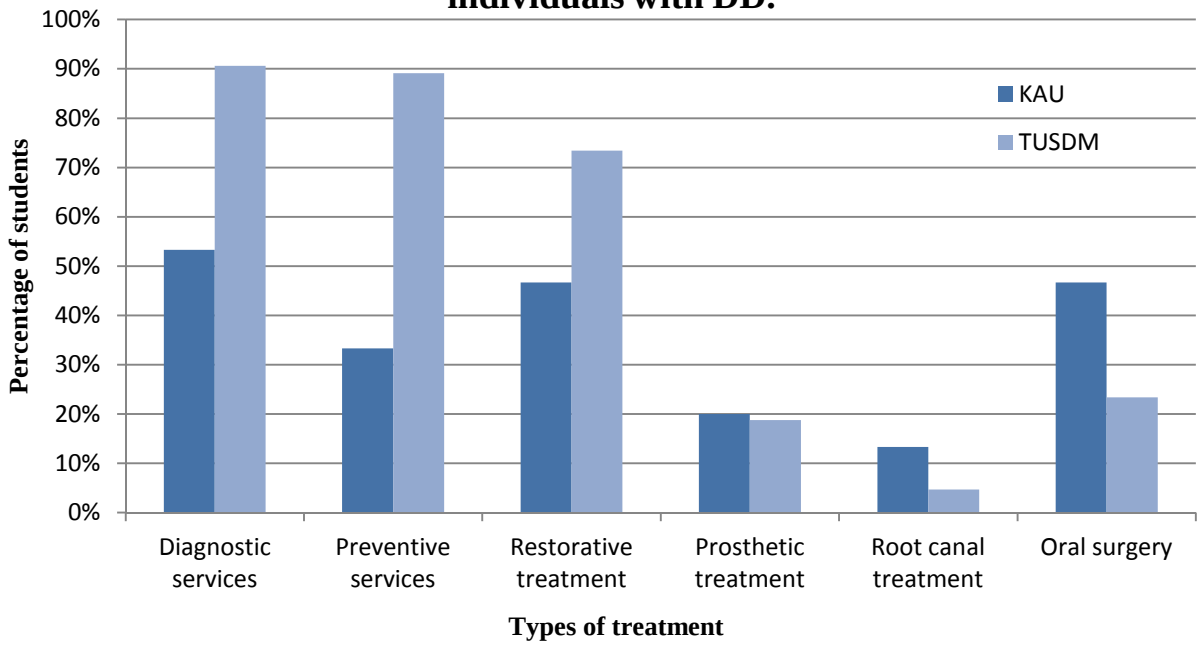
*Percentages reported are valid percentages, excluding missing data.
†p-values derived from Mann-Whitney U tests.
¶NA: Not applicable.

Table 22. A comparison of students who reported being prepared to treat individuals with DD and students who did not in their responses to attitudes statements regarding their instructors.*

Statements	Choices	Not prepared, n (%)	Prepared, n (%)	Total, n (%)	p-value†
"My teachers have not shown me how to respond to the needs of individuals with DD"	Strongly agree	13 (18.3)	1 (2.4)	14 (12.5)	<0.001
	Agree	28 (39.4)	7 (17.1)	35 (31.3)	
	Neither agree nor disagree	21 (29.6)	8 (19.5)	29 (25.9)	
	Disagree	8 (11.3)	20 (48.8)	28 (25.0)	
	Strongly disagree	1 (1.4)	5 (12.2)	6 (5.4)	
"My instructors seem nervous and reluctant to treat individuals with DD"	Strongly agree	2 (2.8)	1 (2.5)	3 (2.7)	0.001
	Agree	6 (8.5)	5 (12.5)	11 (9.9)	
	Neither agree nor disagree	46 (64.8)	9 (22.5)	55 (49.5)	
	Disagree	14 (19.7)	17 (42.5)	31 (27.9)	
	Strongly disagree	3 (4.2)	8 (20.0)	11 (9.9)	
Total	NA¶	71 (61.7)	44 (38.3)	115 (100.0)	NA¶

*Percentages reported are valid percentages, excluding missing data.
†p-values derived from Mann-Whitney U tests.
¶NA: Not applicable.

Figure 1. A comparison of treatments students provided to individuals with DD.



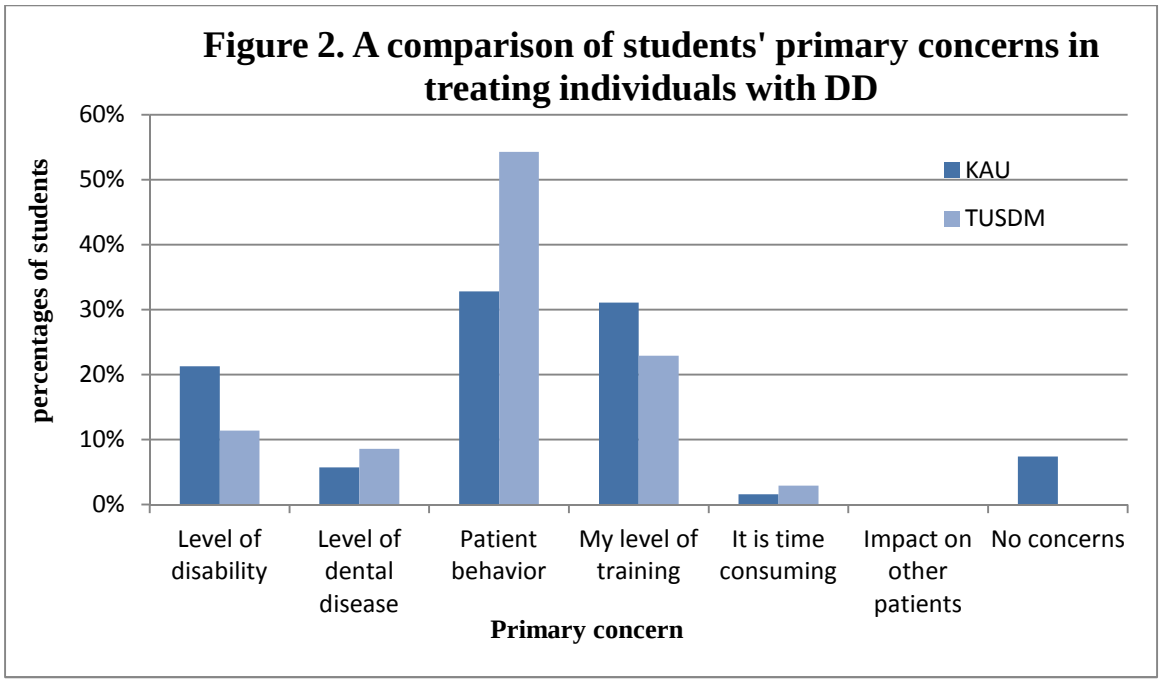


Figure 2. A comparison of students' primary concerns in treating individuals with DD
percentages of students
60%
50%
40%
30%
20%
10%
0%
KAU
TUSDM
Level of disability
Level of dental disease
Patient behavior
My level of training
It is time consuming
Impact on other patients
No concerns
Primary concern

Appendix

Attitudes of Dental Students toward Individuals with Developmental Disabilities

Date of taking this survey: / / 2012

Dear…….

This questionnaire is a part of a Master's research project at Tufts University, School of Dental Medicine. This is an anonymous survey that assesses the barriers to dental professionals in providing care to individuals with developmental disabilities. Developmental disabilities refer to a diverse group of severe chronic conditions that are due to mental and/or physical impairment with onset before the age of 22. This survey is intended to assess the differences between sixth year dental students from King Abdulaziz University and senior dental students from Tufts University.

Section 1 : Background information

1) What is your gender?

1. Male
2. Female

2) What is your age?

3) What is your citizenship?

1. Saudi Arabian
2. American
3. Other (please specify):

4) Which school do you attend?

1. Faculty of Dentistry, King Abdulaziz University
2. Tufts University School of Dental Medicine

5) What is your anticipated date of graduation?

1) 2012
2) 2013
3) 2014

6) Please indicate your primary area of interest?

Please check all that apply:

1. AEGD-General Practice Residency (GPR)
2. Restorative dentistry
3. Endodontics
4. Periodontics
5. Prosthodontics
6. Pediatric dentistry
7. Public Health
8. Orthodontics
9. Oral and Maxillofacial Surgery
10. Oral Pathology
11. Oral Radiology
12. No specific primary area of interest at this time
13. Other, Please specify:

Section 2: Exposure to/or experience treating individuals with developmental disabilities

7) Have you ever treated a patient with a developmental disability (for example intellectual disability, autism spectrum disorders or cerebral palsy)?

1. Yes
2. No

8) Approximately, how many individuals with developmental disabilities (adults and children) have you treated during your dental training?

1. 0
2. 1 – 5
3. 6 - 10
4. 11 – 20
5. > 20

9) If you have treated adults or children with developmental disabilities, what type of dental services have you provided (please check all that apply)?

Please check all that apply:

1. Diagnostic services (examination, x-rays)
2. Preventive services (scaling and root planning, sealants, topical fluoride)
3. Restorative treatment
4. Prosthetic treatment (fixed, removable)
5. Root canal treatment
6. Oral surgery (extractions)
7. Other, please specify

Please indicate the extent to which you agree with the following statements:

10) “Providing dental treatment to individuals with developmental disabilities is challenging”

1) Strongly agree
2) Agree
3) Neither agree nor disagree
4) Disagree
5) Strongly disagree

11) “I would like to provide dental care to individuals with developmental disabilities but I do not have the proper training”

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

12) Has an individual’s developmental disability prevented you from providing dental care?

1. Yes
2. No
3. I have not treated an individual with a developmental disability.

13) Do you know anyone with a developmental disability other than a dental patient you have treated?

1.Yes
2.No

14) If you answered yes on question 12, is that person or persons a:

1. Friend
2. Neighbor
3. Relative
4. Immediate family member

Section 3: Training and education for treating individuals with developmental disabilities

15) Approximately how many hours of training did you have to prepare you to manage the dental needs of individuals with developmental disabilities?

1. 0
2. 1 - 5
3. 6 – 10
4. > 10

16) For senior students from Tufts University:

Have you completed your one week special care rotation?

1. Yes
2. No

17) Has your dental education prepared you to effectively treat individuals with developmental disabilities?

1. Yes
2. No
3. Don’t know

18) Would you like more education concerning the treatment of individuals with developmental disabilities?

1. Yes
2. No

19) If you answered yes to question 18, what type of education would you be interested in?

1. Didactic (courses, lectures)
2. Clinical
3. Both

20) How would you rate your level of experience treating individuals with developmental disabilities?

1. Excellent
2. Very good
3. Good
4. Fair
5. Poor

21) Have you ever used the following techniques to provide dental care for individuals with developmental disabilities (please check all that apply)?

1. I have not treated individuals with developmental disabilities
2. Nitrous Oxide
3. Progressive desensitization
4. Spreading out procedures
5. Medical Stabilization
6. Sedation
7. Referred the patient
8. Other, please specify
9. None of the above

Section 4: Interest evaluation

Please indicate the extent to which you agree with the following statements:

22) “I care about the future dental treatment of individuals with developmental disabilities”

1.Strongly agree
2.Agree
3.Neither agree nor disagree
4.Disagree
5.Strongly disagree

23) “My education has taught me to enjoy treating individuals with developmental disabilities”

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

24) “My educational experience has taught me a tremendous amount about the dental needs of individuals with developmental disabilities”

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

25) “My educational experiences have helped me to enjoy being with individuals with developmental disabilities”

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

26) “The educational experiences I have received have really helped me to interact with individuals with developmental disabilities”

1.Strongly agree
2.Agree
3.Neither agree nor disagree
4.Disagree
5.Strongly disagree

27) “My teachers have shown me how to enjoy treating individuals with developmental disabilities”

1.Strongly agree
2.Agree
3.Neither agree nor disagree
4.Disagree
5.Strongly disagree

28) “My teachers really demonstrate enthusiasm about treating individuals with developmental disabilities”

1.Strongly agree
2.Agree
3.Neither agree nor disagree
4.Disagree
5.Strongly disagree

29) “My teachers have not shown me how to respond to the needs of individuals with developmental disabilities”

1. Strongly agree

2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

30) “My instructors seem nervous and reluctant to treat individuals with developmental disabilities”

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

31) “My educational training has made me confident to treat individuals with developmental disabilities”

1. Strongly Agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

32) “The program for treatment of individuals with developmental disabilities at my school is really good”

1. Strongly Agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

33) “I am not interested in learning anything else about individuals with developmental disabilities”

1. Strongly Agree
2. Agree

3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

34) “When treating individuals with developmental disabilities, I find it difficult to respond to them”

1. Strongly Agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

35) “Dental treatment for individuals with developmental disabilities is very discouraging”

1. Strongly Agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

36) “I would not particularly desire individuals with developmental disabilities in my practice”

1. Strongly Agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

37) “The more severe the developmental disability, the lesser the need for restorative dentistry”

1. Strongly Agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

38) “Dental services for individuals with developmental disabilities should only be provided in a hospital”

1. Strongly Agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

39) What is your primary concern in providing dental treatments to individuals with developmental disabilities? Check only one:

1. Level of disability
2. Level of dental disease
3. Patient behavior
4. My level of training
5. It is time consuming
6. Impact on other patients
7. Other (Please specify):
8. No concerns

40) Are you interested in providing dental care to individuals with developmental disabilities as a part of your dental career?

1. Yes
2. No
3. Not sure

Thank you for taking this survey.