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Oral health disparities of Sudanese refugees of the Dinka and Nuer tribes

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Thesis

ORAL HEALTH DISPARITIES OF SUDANESE REFUGEES OF THE DINKA AND NUER TRIBES

by

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B.S., Millersville University, 2011

Submitted in partial fulfillment of the requirements for the degree of
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ORAL HEALTH DISPARITIES OF SUDANESE REFUGEES OF THE DINKA AND NUER TRIBES

RUTH M. SIMEON

Boston University School of Medicine, 2013

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ABSTRACT

There are different levels of acculturation refugees undergo upon arrival to a foreign location, including integration. Ritualistic anterior dentition extraction is the greatest barrier to integration for the Sudanese refugees of the Dinka & Nuer tribes. Due to this barrier, oral health disparities for these refugees include malocclusion, chewing, simple biting, and speech articulation. In this study, it is concluded that most refuges could benefit from dental implants for dental restoration psychologically and emotionally. This study revisited the need for an oral hygiene program post-dental restoration to help combat oral disparities for these Sudanese refugees. Based on the literature review of the published studies, a proposed program plan was developed to fit the needs of the Dinka & Nuer Sudanese refugees.
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INTRODUCTION

Refugees can experience traumatic events which could affect their physical and mental well-being. The United Nation (UN) defines a refugee as

“a person forced to flee his or her country of origin due to persecution or fear of persecution because of race, religion, nationality, membership in a particular social group, or political opinion” (School Health Manual, 2007).

The refugee’s status is determined before arriving to their new country. Refugees are stripped away from their niche and have to adapt to a new culture through acculturation. Many refugees experience traumatic events prior to arrival due to conflict in their country. These traumatic events may affect the overall systemic health of the citizens, including oral health. Overseas medical screenings are required before entry into the country but sometimes the mouth is overlooked therefore leading to increased risk for poor oral health.

There are different levels of acculturation refugees undergo upon arrival to a foreign location. One level of acculturation is integration. Integration involves a cultural compromise in which the individual functions as an integral part of mainstream society while simultaneously maintaining their own cultural
integrity (Fox et al., 2010). Through integration, the refugees are adjusting to the American culture while preserving parts of their culture.

Integration can be a very stressful process for the refugees leading to acculturative stress. For an example refugees may flee a tropical, equatorial climate and arrive in a temperate zone with extreme cold, heat, and humidity (Fox et al., 2010). Acculturative stress can affect the overall systemic health of refugees. Through one study by Fox et al., acculturative stress had been linked to increased susceptibility to chronic diseases, including cancer, diabetes, hypertension, coronary heart disease, and mental illness (Fox et al., 2010).

Although the course of acculturation can be stressful, the process of integration can help with the process of acculturation and the overall mental health of refugees long-term. It is incontrovertibly recognized that refugees are the victims of multiple stressors and traumas, that the impact of such exposure is cumulative, that psychiatric distress represents a long-term risk for some, and that it can be compounded by the process of acculturation (Fox et al., 2010). One study by Fox et al. examined acculturative stress and the mental health of refugees. Integration as the acculturation strategy has often proven to be a more consistent predictor of desirable psychological outcomes among immigrant populations (Fox et al., 2010).
Sudanese Refugees

Located in the eastern region of the African continent and north of the equator, Sudan is divided by the Sahara desert (Willis et al., 2008); (Figure 1). More than 400 different languages and dialects are spoken among Sudan’s 597 ethnic groups (Duany, 2001). The two largest ethnic groups of Southern Sudan are the Dinka and the Nuer (Willis et al., 2011). Conflict in Sudan exists between the northern and southern parts of Sudan. The major lines of ethnic conflict in the south fall along the borders of the Dinka and Nuer people (Duany, 2001). Escaping conflict, the refugees can experience traumatic events which could affect their physical and mental health. Although refugees from Africa’s largest country, Sudan, began to flee as the civil war escalated in the 1980s, the majority arrived to the U.S. during 2000 (Willis et al., 2011). Refugees from war-torn Sudan have a strong desire to succeed because they cannot return to their home in the near future or at all (Willis et al., 2005).
Sudan is located north of the equator, in the eastern region of the African continent. Adapted from Multicultural Refugee Coalition at http://mrcaustin.org

The Ritual of Sudanese Tooth Extraction

It is in the sub-Saharan Africa, where anterior tooth extraction occurs just after permanent tooth eruption and has been associated with adulthood, beauty, tribal identity, sound production, and soft food consumption (Willis et al., 2008). Historically, at least nine such cultures from Southern Sudan removed anterior
teeth during some or all of their recent history, and this practice has become inextricably linked to tribal identity (Willis et al., 2005). Those populations that once extracted teeth and those that continue to extract two to six mandibular or maxillary anterior teeth (such as Dinka and Nuer people) live near Africa’s Nile River or in the Nile valley, or are pastoralists whose lives center around cattle (Willis et al., 2005). The ritual removal of anterior teeth among sub-Saharan African populations is likely an ancients practice, at least 1500 years old, and may have originated when tetanus incidence rates were high and lockjaw made food intake difficult, if not impossible (Fox et al., 2010). An open space in lower jaw would allow the tongue to be depressed and liquid be inserted (Willis et al., 2011).

Certain tribes of Sudanese refugees practice the extraction of anterior dentition as a ritual (Figures 2 and 3). Sudanese refugees of the Dinka and Nuer tribes perform anterior dental extraction (incisors and canines) as a ritual for rites of passage near the time of permanent eruption (Willis et al., 2005). In fact, removal of the lower anterior teeth was once mandatory for both boys and girls at the time of permanent eruption, and was linked to enhanced sound productions, an attractive appearance, preparation for marriage and tribal identity (Willis et al., 2011). For an example, if the mandibular teeth were not
extracted, they could not talk to older boys or any of the girls and would be considered immature (Willis et al., 2008). This ritual act done by the Dinka and Nuer tribes becomes problematic for refugees who are trying to fit in with society when they arrive to their new country. Many required elements of life, such as anterior tooth extraction, no longer have meaning in the U.S., despite their significance for generations of Dinka and Nuer (Willis et al., 2011).

Figure 2. The Anterior Dentition of an adult Male from the Dinka tribe of Sudan prior to Dental Restoration. Childhood extractions form the Dinka tribe included mandibular incisors and canines. Original from Willis et al., 2005.
There were several types of ritually extracted teeth among the Dinka and Nuer Sudanese tribes that were observed in studies. The traditional removal of six to eight permanent and healthy teeth, just after eruption is the largest number of anterior extractions performed by any culture now documented in the literature (Willis et. al, 2005). Out of the five subjects that were examined, the Dinka tribes had a total of six extractions and the Nuer tribes had a total of eight extractions. Extractions of the upper canines were also observed in the refugees who were part of the Nuer tribes (Figure 3). Among the Nuer, it was not just the mandibular canines that were extracted and furthermore, although not previously described, the permanent maxillary canines were also removed among the Nuer (Willis et al., 2008).
Figure 3. The Anterior Dentition of an adult Female from the Nuer a tribe of Sudan prior to Dental Restoration. Childhood extractions form the Nuer tribe included mandibular incisors, mandibular canines, and maxillary canines. Original from Willis et al., 2005.

Generally, the person who does the extraction is someone who is valued and chosen by the tribal community. The Nuer tribe extractor is known as the naak. The extractor or naak is a highly respected adult male (Willis et al, 2008).

Comments from the Sudanese refugees from the Nuer tribe regarding the anterior dentition extraction procedure done by the naak include the following:
The Dinka tribe extractor is also known as the *raan de hoth*. The stories of how the dentition extractions were done were reported by Willis et al. in 2008 and are shown below.

“The extractor or *naak* was highly respected adult male. The only dental procedure he performed was to remove teeth and he was not for this work. The child lay prone with arms and legs restrained. The *naak* knelt and placed the child’s head between the knees. With the hand beneath the child’s chin, he pulled the child’s mouth up and back and used his other hand to place a small knife-like instrument between the central incisors. He moved the instrument from side-to-side, luxating the teeth at the midline. The sharp-edge knife was moved to the lingual side of the incisors; the gingival tissues were separated from the root surfaces and with an upward motion, tooth was ‘plucked’ out. The entire process was done ‘quickly’ although the time frame could not be recalled. No anesthetic was provided; still the patient did not cry. The absence of tears was important to one’s reputation. Hot milk was provided after removal but nothing else was placed on surgical site. The patient remembers a headache, that the procedure was ‘very painful’, but has no recall but has not recall related to the removal of the tooth that left the residual root. Within two weeks, the site had healed and he has no further pain” (Willis et al., 2008).

Usually the child is restrained at the arms and legs and the extractor uses a sharp instrument to essentially “pluck” the tooth out of the socket. No anesthetic is utilized and the patient refrains from crying (Willis et al, 2008). Traditional post-operative techniques included use of boiled water after surgery, cleaning
with sticks of *Salvadora persica* (the toothbrush tree) (Figure 4), and the use by both Dinka and Nuer of cow dung ash as a dentifrice (Willis et al, 2008).

**Figure 4. Salvador a persica (the toothbrush tree)** The twigs from this tree is used to make toothbrushes. (Adapted from M. Madella at http://www.phytolith.net)

Comments from the Sudanese refugees from the Dinka tribe regarding the anterior dentition extraction procedure done by the *Raan de Hoth* extractor from the Dinka Tribe are shown below (Willis et al., 2008).

“He too did not cry. He escaped teasing from others and confirmed his manhood. Emitting neither tears nor sounds, he was not restrained. He sat upright, his head ‘squeezed’ between the knees of the well-known village extractor or *raan de hoth*. Using a procedure similar to that described above, the mandibular incisors were luxated at the midline using a finger-
sized spear, narrow, and sharp at the end. Once the teeth were loosened, the extractor ‘dug’ on the lingual side of the child’s gingival tissue and the teeth were ‘popped’ out” (Willis et al., 2008).

There aren’t as many cases of ritualistic dental extraction seen in their society today. At present, it is unclear whether anterior tooth extraction is still performed in Southern Sudan; it was outlawed by the Southern People’s Liberation Army (SPLA) in late 1986 or early 1987 to eliminate ethnic identification and associated genocide by the Northern Sudanese Government (Fox et al., 2010). There is some evidence that this ritual tooth extraction is still being practiced today. Recent media coverage suggests that extraction practices may still exist in at least some remote Southern Sudanese communities (Fox et al., 2010).

In today’s society, this refugee experience is a hindrance in the accomplishment of integration in the new country. For example, in Sudan the removal of the 6 lower teeth, with the resulting inclined lip, was considered beautiful and a mark of one’s ethnic identity (Willis et al., 2011). This ritualistic act results in a…

“consequence of the resulting tongue thrusting having significant problems with speech articulation, malocclusion, and simple biting and chewing” in the new country (Cote et al., 2004).
But to achieve this integrated, more psychologically-adaptive level of acculturation, one must, as in the case of assimilation, have opportunity. In the case of refugees from Sudan to the US, such opportunity can be either encouraged or hindered by dental appearance (Fox et al. 2010). Refugees sought restoration within the first few months after arrival to the US and attributed their strong desire for restoration to limit embarrassment about their dentition condition and becoming more ‘American’ (Willis et al, 2008). After dental restoration, all patients [refugees] required detailed oral hygiene education to fill the knowledge gap between traditional and U.S. systems and to maintain their newly restored dental health status (Willis et al., 2011).
The Current Study

The current study aims to address the need for an oral hygiene education and training program that will specifically meet the needs of the Sudanese refugees from the Dinka and Nuer tribes. We hope these studies will provide additional information on the current oral health status and practices of the Sudanese- Dinka and Nuer refugees, and that the patients benefit of dental restoration. With this information, we hope to develop a sample oral hygiene program that may be given to endure increase the oral health status of this population.
PUBLISHED STUDIES

Oral Health Status of Refugees

African refugees in the US represent approximately half of the refugee population (53.6%) with the majority from Somalia, Liberia, and Sudan (Cote et al., 2004). Screenings completed overseas often overlook the dental issues of refugees prior to entrance into the United States. Dental problems that are common in refugees include caries, abscesses, fistulae, gingivitis, and sequelae of trauma (Barnett, 2004). The dental issues of greatest concern in Africa, including Canrum oris, acute necrotizing ulcerative gingivitis and oral manifestations of HIV/AIDS, have not yet been reported among refugees from the Sudan in the U.S. (Willis et al., 2011).

There were several studies done to evaluate the oral health status of refugees. One study done by Singh et al., evaluated the oral health status of 216 tortured refugees. Patients were from 43 countries, primarily from Africa (79%); 52% were asylum seekers, 24% were refugees and 11% had been granted asylum (Singh et al., 2008). Torture survivors who migrate to the United States as refugees or asylum seekers often have unique health needs and problems, including dental needs (Singh et al., 2008). Dental health among refugees varies
depending on their country’s origin and the natural resources provided to support oral health. Results showed that patients’ dental health ranged from poor to fair; 76% had untreated cavities, and approximately 90% required immediate or near-immediate care (Singh et al., 2008).

The number of dentist visits for these previously tortured refugees, once established in the new country, has been evaluated in the same study done by Singh et al. in 2008; this study has shown how many refugees visited the dentist within one to five years. Twenty percent of the patients had visited a dentist within the past year, 13% had done so within the preceding 1 or 2 years, and 23% had done so within the preceding 2 to 5 years; 20% had not visited a dentist in more than 5 years, and 23% had never visited a dentist (Singh et al., 2008).

The current oral health statues of these previously tortured refugees were also evaluated in this study. Of the patients who sought a dental screening approximately 15% had no fillings, 76% had untreated decay (in the overall sample, the median number of teeth with untreated cavities was 3), 30% had tooth or gum pain, 48% had mild gingival inflammation; Approximately 12% of patients needed immediate treatment, and 74.9% needed dental care within weeks of their initial evaluation (Singh et al., 2008).
Oral Hygiene Practices of the Sudanese Dinka & Nuer Tribes

The oral health statuses of 34 Sudanese adults of the Dinka or Nuer tribes were evaluated in another study done by Willis et al. prior to their dental restoration treatment. For example, all participants were in need of a routine prophylaxis, and nearly 20% require more extensive cleaning; nearly one-third were diagnosed with various levels of periodontal disease; similarly, one-third required fillings or crowns (Willis et al., 2011). In this study, it was found that the traditional oral hygiene practices parallel Western oral hygiene methods. Their current oral hygiene involved one brushing event per day and prevalent toothpick use (Willis et al., 2011). Few had visited a United States dental facility more than once, and none were using biannual checkups to maintain dental health (Willis et al., 2011).

There are some differences in the oral health practices that are customary to the Sudanese Dinka & Nuer tribes. There have been reports of the refugees using cleaning sticks from the “toothbrush” tree (Salvadora persica and related species) as toothbrushes in Sudan and the refugee camps (Willis et al., 2005). Other traditional dental hygiene practices of the Dinka and Nuer, as reported in this study consisted of 3 primary methods (Tables 1 and 2).
Table 1. The Traditional Oral Hygiene Method of Cleaning Among the Sudanese Dinka Lost Boys. Original from Willis et al., 2011.

<table>
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<tr>
<th>Method of Cleaning</th>
<th>n=15</th>
<th>Percent</th>
</tr>
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<tr>
<td>Cow-Dung Ash</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>Ash Use Unknown</td>
<td>12</td>
<td>80</td>
</tr>
<tr>
<td>Stick use/day: 1x</td>
<td>3</td>
<td>20</td>
</tr>
<tr>
<td>2x</td>
<td>6</td>
<td>40</td>
</tr>
<tr>
<td>3x+</td>
<td>6</td>
<td>40</td>
</tr>
<tr>
<td>Reeds and Grasses</td>
<td>7</td>
<td>47</td>
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Table 2. The Traditional Oral Hygiene Method of Cleaning Among the Sudanese Nuer Tribe. Original from Willis et al., 2011.

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<tr>
<th>Method of Cleaning</th>
<th>n=19</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cow-Dung Ash</td>
<td>15</td>
<td>79</td>
</tr>
<tr>
<td>Ash Use Unknown</td>
<td>4</td>
<td>21</td>
</tr>
<tr>
<td>Stick use/day: 1x</td>
<td>4</td>
<td>21</td>
</tr>
<tr>
<td>2x</td>
<td>10</td>
<td>53</td>
</tr>
<tr>
<td>3x+</td>
<td>02</td>
<td>11</td>
</tr>
<tr>
<td>Reeds and Grasses</td>
<td>10</td>
<td>53</td>
</tr>
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The first oral hygiene method is similar to brushing with toothpaste in the United States and makes use of the use of the ash taken from cow dung fires (Willis et al., 2011). This ash can be formed into different textures and has a different taste than the common toothpaste used in the United States. The participants reported that ash could be applied to the teeth directly or water could be mixed to make a paste (Willis et al., 2011). The ash-paste (arop in Dinka and pok in Nuer) was described as grainy or textured, providing an abrasive cleanser during brushing (Willis et al., 2011). The index finger is used to brush and apply this baking soda-like cleaner (Willis et al., 2011). The ash-paste has similar effects seen in whitening toothpaste. Several participants reported a salty taste to the ash, and that this cleaning method resulted in very white teeth (Willis et al., 2011).

The second method combines brushing and a kind of inter-dental cleansing through use of the “toothbrush tree,” a method that involves the use of a stick or branch of Salvadora persica; The toothbrush formed from the “toothbrush tree” is also known as the miswak in Arabic, achuil in Dinka and chuil Nuer) (Willis et al., 2011) (Figure 5). Sticks of approximately 8 inches in length are cut from the evergreen shrub or small tree, Salvadora persica, and one end is forceful rubbed against the teeth until it splays, creating a bristled brush (Willis
et al., 2011). The stick is applied to the teeth and a scrubbing, circular motion is used until the stick itself splays (Willis et al., 2011). The ends then allow until the teeth to be cleaned and scrubbed between the teeth and gums; all of the participants reported daily use of this method (Willis et al., 2011).

Figure 5. The Miswak “Toothbrush” The miswak is made from *Salvadora persica* or similar plants. Original from Flowers in Israel retrieved from www.flowersinisrael.com.

Studies have shown that people who use the miswak may have healthier periodontal tissue. It is concluded that the periodontal status of miswak users in this Sudanese population is better than that of toothbrush users, suggesting that the efficacy of miswak use for oral hygiene in this group is comparable or
slightly better than a toothbrush (Darout et al., 2000). The use of the miswak also aid in preventing cavities. The plant *Salvadora persica* has inhibitory effects on multiple strains of caries inducing aerobic bacteria, such as *Streptococcus mutans*, such common use is not surprising (Willis et al., 2011).

The Dinka and Nuer refugees also use an oral hygiene method that is similar to dental floss. Reeds and grasses are used to clean between the teeth in the same manner that dental floss is used (Willis et al., 2011). The exact type of reeds and name scientific names of the plants could not be identified. This type of cleaning is typically seen after meat consumption. In the study done by Willis et al. in 2011, refugees also commented on using a different method for teeth cleaning after moving the United States. The majority of participants (71%) reported use of toothpicks for cleaning between teeth (Willis et al., 2011).

There are some similarities and differences in the oral health practices seen among the Dinka and Nuer Tribes and Western medicine. Although each of the above three methods can be described as comparable to Western oral hygiene practices, there is no direct connection from one dental hygiene system to the other (Willis et al., 2011).
Dental Restoration

Many Sudanese refugees seek dental restoration within the initial couple of months after arrival to the United States. Some problems that the Sudanese refugees that had the anterior dental extractions faced are malocclusion, chewing, simple biting, and speech articulation.

A case study was done by Willis et al. (2005) where they interviewed five adult Sudanese refugees from the Dinka or Nuer tribes pre- and post-dental restoration. The participants in this study were given a fixed prosthesis attached to three titanium implants to restore the anterior dentition.

“All subjects had initial surgical placement of mandibular anterior implants (Stage 1) in October 2002. Once placed, the implants were left submerged for four to six months to allow for osseointegration. All of the implants were exposed through a second surgical procedure (Stage II), and healing abutments were placed on the implants. A series of appointments were required to fabricate the fixed restorations. All surgical and restorative procedures proceeded without incident” (Willis et al., 2005).

Many in the Sudanese community have to use removable partial dentures due to the extraction. In this study some Sudanese refugees reported dissatisfaction with the removable partial prostheses (RPD) because they did not provide adequate confidence or oral function; the Sudanese were embarrassed to
wear them because the dentures did not stay in place, and they could not eat desired foods (Willis et al., 2005).

Historically, the Dinka extracted teeth to produce a “hissing” sound, but such a sound is not valued in the U.S. and often signals missing teeth (Willis et al., 2005). In one study done by Fox et al., the psychological impact of dental restoration among the Sudanese Dinka & Nuer refugees was evaluated. It is conceivable that dental restoration in the current study constructively contributed to the cultural bereavement process by having an impact on the replacement of social structures and self-identity; thus, dental implants for this population of refugees from Sudan should contribute to their overall health and well-being (Fox et al., 2010).

The anterior dental extraction has also has an effect on their speech and the ability to pronounce some words in the English language. In the study done by Willis et al. in 2005, the participants who were from the Dinka and Nuer tribes reported that some English sounds were difficult to make without their anterior teeth, such as “h,” “th,” “v” and “s” prior to dental restoration. Two said they avoided speaking because they could not enunciate English words in the same way that most native English speakers did (Willis et al. in 2005). Post restoration,
however, the refugees reported a change in their confidence and ability to produce sounds in English.

The emotions of refugees before and after dental restoration were also documented in studies. The results indicate that participants reported significant improvement in a variety of symptoms that encompass somatic, emotional, and cognitive expressions of distress that could be classified under the rubric of anxiety and depression (Fox et al., 2010). Five general themes emerged among the common responses and included a heightened sense of belonging and interpersonal connectedness, decreased need to explain facial appearance, improved self-image, and improved ability to eat or process the same foods much like other Americans (Fox et al., 2010). The refugees reported a change in their confidence and ability to produce sounds in English and they also indicated that they smile more often and noted a change in self-image from a positive general attitude to feeling “very good” about their appearance (Willis et al., 2005), (Figure 6). Dental restoration provides a cultural intervention that has a markedly positive impact on a wide variety of expressions of somatic and psychological distress that are subsumed under the Western diagnostic constructs of depression, anxiety, and PSTD (Fox et al., 2010). The quantitative and qualitative results of the study strongly suggest that dental restoration offers
protection from stressors associated with the refugee experience as demonstrated by significant decreases in reported symptoms of distress associated with depression, anxiety, and PTSD (Fox et al., 2010).

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<th>Belonging/Sense of Community</th>
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<td>“I feel more connected.”</td>
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<td>“I fit in the community now.”</td>
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<td>“When people smile, I also smile now.”</td>
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<th>Need for Explanation</th>
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<td>“I no longer have to explain to people about my teeth.”</td>
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<td>“No more are people asking ‘Were you in an accident?’”</td>
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<tr>
<td>“When in a group, people do not ask anymore if I was born that way with no lower teeth”</td>
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<tr>
<td>“They are not staring at me anymore.”</td>
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<table>
<thead>
<tr>
<th>On Speech Ability/Sound Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>“I can pronounce words correctly now; my communication is more effective.”</td>
</tr>
<tr>
<td>“People don’t always ask ‘What did you say? Excuse me?’”</td>
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</table>

<table>
<thead>
<tr>
<th>Self-Image</th>
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<tbody>
<tr>
<td>“I feel proud about the teeth I have.”</td>
</tr>
<tr>
<td>“I feel like a different person.”</td>
</tr>
<tr>
<td>“I see myself in a better way.”</td>
</tr>
<tr>
<td>“I smile more. I am more happy than before.”</td>
</tr>
<tr>
<td>“I feel more free to smile.”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Food Processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>“I feel great! People say I look good and I get to eat all sorts of fruit.”</td>
</tr>
<tr>
<td>“I can eat fruits that I could not before.”</td>
</tr>
<tr>
<td>“I can eat an apple properly.”</td>
</tr>
</tbody>
</table>

Figure 6. Comments from Sudanese Refugees from the Dinka and Nuer tribes after Completed Dental Restoration Original taken from Fox et al., 2010.
**Nutrition and Oral Health**

Nutrition and how it relates to the Sudanese Dinka and Nuer refugees oral health was also evaluated. Before restoration of the anterior dentition, participants could not incise typical foods eaten in the U.S. and expressed embarrassment about their dental status, which limited smiling, speaking and social interaction (Willis et al., 2005). Dental restoration broadened the ability to eat common foods in the United States that would have been initially difficult to overcome for the Sudanese – Dinka & Nuer refugees.

In the study done by Willis et al., they used the common American foods (apple, beef jerky, carrot, celery, roast beef, and spinach leaves) to measure their ability to process foods. Each participant was presented with each food item and asked to demonstrate how they would eat it, if it was served raw (Table 3). Before restoration of the extracted mandibular teeth, participants generally were unable to use the remaining maxillary incisors to nip or pierce a piece of carrot, celery or roast beef in preparation for mastication (Willis et al., 2005). A different method is used for food mastication. To chew most of the food items, participants began by placing the food at the side of the mouth for incising (Willis et al., 2005).
Table 3. The Pre-Restoration Processing Ability among Refugee Participants
Original from Willis et al., 2005.
The refugees in this study were able to obtain dentition close to its natural state. Once the implants had restored the dentition, all participants were able to incise food as if they had a natural dentition (Willis et al. in 2005). After the restoration, the refugees were able to eat common food in the U.S., in public settlings and with American colleagues and friends, without needing to use noticeable head movements or extensive food preparation (Willis et al., 2005).

African refugee populations have had limited access to sweeteners of any kind while living in camps, and do not regularly consume sugar as part of a traditional diet (Willis et al., 2011). Traditional Sudanese diets include liquids such as milk and well-cooked or stewed foods (Willis et al., 2005). The diet in the United States includes the consumption of food that contains refined sugars. The most notable dietary change for these Sudanese refugees was the inclusion of refined sugar snacks (Willis et al., 2005). The negative impact on dental health of sugary foods, drinks and snacks would be similar to that seen in the dental health of U.S. children (Willis et al., 2005). In this study, the refugees did not report an increase inclusion of food that could possible harm their oral health status after dental restoration. Refugees reported that their diets and/or food preparation techniques had not changed after implant restoration; they ate the same foods and used the same preparation techniques (Willis et al., 2005). It was
concluded in this study that people do not necessarily alter dietary patterns once oral health status has improved (Willis et al., 2005).

**Oral Health Screening of Refugees**

Performing an oral health screening is important for evaluating the current oral health status of a population. The benefits to oral health screening are catching diseases early and allowing one to provide referral service for dental services. Oral health screening can be done by a dental professional or by someone who is trained. According to Singh et al., Information obtained by the screeners may include:

1. Demographic and contact information.
2. Need for interpreter assistance.
3. Significant medical history.
4. Significant trauma history.
5. Dentition and number of teeth.
6. Decay experience (Untreated Cavities/Restorations).
7. Periodontal/Gingival Index.
8. Oral Hygiene
9. Oral pathology
10. Previous dental care.

Based on the above, treatment urgency is determined by the screener. Also in this study, screening considerations for practitioners were provided in order to ensure a successful screening (Singh et al., 2008). Screeners must obtain
important information and have special considerations when conducting an oral health screening of refugees (Table 4).

**Table 4. Special Screening Considerations for Practitioners** Adapted from Singh et al., 2008.

| • Welcoming and non-traumatizing environment |
| • Before screening, an informal conversation must be conducted, including patient’s background and possible torture experience |
| • Physical and psychological symptoms must be considered |
| • Avoid situations that may evoke torture memories |
| • Secure patient’s trust and confidence |
| • Respect the individual |
| • Inform carefully about examination |
DISCUSSION

The overall need for refugee dental care has been assessed in a limited number of studies (Willis et al., 2011). The results of this study demonstrated that this refugee population from Sudan had limited knowledge of, and experience with, Western oral hygiene methods (Willis et al., 2011). The published results in this current study provided evidence for the necessity for an oral hygiene education and training program that will specifically meet the needs of the Sudanese refugees from the Dinka and Nuer tribes.

The oral health status of refugees is often overlooked when entering the United States due to the lack of screening. There are many dental issues that are commonly seen in refugees such as caries, abscesses, fistulae, gingivitis, and sequelae of trauma (Barnett, 2004). There should be oral hygiene programs offered in the areas where there is a heavy population of refugees. For an example, screening should be offered yearly by dental schools and local dental clinics should be offered to refugees to assess the oral health statues of refugees.

Studies has shown positive impact of refugees when they chose to integrate with the new culture. There may be some limitations to integration for refugees based on their past experience in their native country; whether it is through acts of torture or ritualistic customs. The refugees with the dental
extractions may be impaired and as a result unable to fully integrate into the new culture. Most Dinka and Nuer begin their resettlement to the United States with a physical expression of culture one which is both highly visible and not easily ‘integrated’ under any circumstance as they possess a large visible gap in the lower jaw, a once significant indicator of tribal identity (Fox et al., 2010). Tasks that may be difficult are food consumption, speaking the English language and interaction with other people. To ease the process of resettlement for this specific group of refugees, appropriate dental restoration through dental implants may be required. Dental restoration for Dinka and Nuer refugees may effectively serve to ameliorate the stress associated with acculturation (Fox et al., 2010).

As seen in the published studies, Sudanese refugees, who have the dental extraction done for the rites of passage, often come to the United States wanting restorative care. In Western culture, dental standards can alter one’s self-image if they cannot be achieved or maintained (Willis et al., 2005). For example, Midwestern college students rated those with missing teeth as less attractive, less healthy, and less educated; Moreover, they did not wish to live near, date or befriend an individual who is even partially edentulous (Fox et al., 2010). Consequently, refugees who arrive in the U.S. missing their anterior teeth, particularly young adults aged 17 to 45 years face a different set of cultural
standards and health factors that prompt a desire to restore their dentition (Willis et al., 2005).

There are many oral health disparities that the Sudanese – Dinka and Nuer tribe refugees face both in Sudan in the refugee camps and in the United States. Although the ideal dental restorative care for these Sudanese refugees would be dental implants, cost and dental coverage can be a barrier to obtain this treatment. Typically, the refugee population in this sample had limited access to any oral hygiene care or dental treatment while in refugee camps, and minimal access to Western oral hygiene education, treatment and dental coverage since coming to the U.S. (Willis et al., 2011).

Refugees and immigrants have separate, distinct legal statuses in the U.S. which may entitle them to different levels of access to public benefits and services such as health insurance (School Health Manual, 2007). Dental coverage among a sample of the Sudanese refugees from the Dinka & Nuer tribes living in the United States is poor. Willis et al. (2011) reported that out of 34 Sudanese refugees from the Dink and Nuer tribes, the majority had no dental coverage and less that 5 of the 34 had work related or Medicaid coverage. Obtaining treatment for dental problems is challenging in the United States, where insurance plans continue to cut reimbursement, and it is increasingly difficult to find dental care
covered by public assistance programs (Barnett, 2004). Neither Medicaid nor private insurance reimburses for implants, which are considered elective, and the cost of the definitive restoration was more than $6,000 per person (Willis et al., 2005). Specifically for the Sudanese – Dinka & Nuer tribe population, the cost of dental implants without any public assistance hinders this population from obtaining the restorative care need for full integration into the new country.

The limited use of Western dental care is likely related to the lack of dental coverage, expendable monetary resources and knowledge of Western preventative systems (Willis et al., 2011). Healthcare professionals and institutions can play a role combating oral health disparities among the refugee population. Health care professionals seeing refugees may benefit from developing relationships with local dental practices receptive to treating dental problems in refugees (Barnett, 2004). Also a dental teaching institution could provide lower charges for a refugee population, among which more than 60 percent lived at or below the 2004 U.S. poverty level and just 38 percent of these had dental insurance (Willis et al., 2005).

Many people from refugee backgrounds will not have had access to comprehensive health care for years, if ever (Vallejo, 2007). Refugees may often seek traditional treatment before considering seeing a physician. The health care
system will often seem very complicated to refugees and they may need assistance with acquiring prescriptions and other tasks (Vallejo, 2007). Once torture [refugee] survivors have relocated to the United States, their ability to obtain care is hindered by the cost of dental services, their low socioeconomic status and typically limited English-language proficiency, and their minority status with its adverse social and cultural implications (Singh et al., 2008). Finally, limited dental visits may be linked to a lack of understanding related to preventative health care systems and the associated knowledge of Western dental ailments (Willis et al., 2011). This is why it is important to incorporate a course that teaches special considerations for refugees into the dental school curriculum, especially in the areas of the United States that have a huge population of refugees, in order to bridge the gap of disparities.

There are resources available for refugees to help with the process of acculturation.

“…Clinics with traditions of serving newcomer communities (e.g., community health centers) may help facilitate access to care for refugee and immigrant families and provide specialized care such as treatment for torture or trauma” (School Health Manual, 2007).

There is a need for oral health education for refugees at the community centers. Resettlement programs for refugees usually focus on English as a Second
Language classes, family literacy, and citizenship preparation. “…Clinics with traditions of serving newcomer communities (e.g., community health centers) may help facilitate access to care for refugee and immigrant families and provide specialized care such as treatment for torture or trauma” (School Health Manual, 2007). There is a need for oral health education for refugees at the community centers.

U.S. refugee resettlement programs do not routinely provide health assessment services and treatment or require mental health assessment at arrival for any refugee population, regardless of the experiences encountered prior to, during, or after flight from one’s country of origin (Fox et al., 2010). Domestic refugee resettlement programs do not routinely provide dental screenings, treatments or hygiene education for any refugee population, regardless of potential need and experience with Western health systems (Willis et al, 2011). This means that refugee populations in the U.S. are likely to have dental care needs that go untreated for an extended period of time, requiring invasive treatment and more extensive costs in emergency care facilities (Willis et al., 2011). Resettlement programs should include dental screening, treatment and oral hygiene training to prevent further decline in dental health status (Willis et al., 2011). In the study done by Willis & Bothun it was concluded that all
participants required detailed oral hygiene education to fill the knowledge gap between traditional and U.S. systems and to maintain their newly restored dental health status (Willis et al., 2011).

It is critical to evaluate the current dental system of the Sudanese refugees in order to create an effective oral hygiene program for this population. It is already seen in one study that the lack of knowledge concerning traditional, non-Western dental systems means that effective oral hygiene training cannot be designed for newly arriving populations (Willis et al., 2011). Based on the published studies, oral health education program for refugees should include topics on oral health hygiene, nutrition, and access to care. Despite the fact that results of the study by Willis et al. in 2011 may not be representative of refugees from Africa to the U.S., it is clear that a different kind of oral hygiene training is necessary for populations such as the Dinka and Nuer, who never been exposed to Western health systems, but must now use them to survive.

Nutrition and diet are different for the Sudanese in Western society than what they are used to in their native country; This may impact their oral health status. In Sudan, refugees rarely eat foods or products that have sugar added (Willis et al., 2005). Rice was the most common item in their U.S. diet, while three consumed stewed beef during a typical meal. Bread was regularly consumed by
two subjects as well (Willis et al., 2005). All five participants in the Willis et al. study indicated that they now drank milk daily, and both juice and soda weekly (Willis et al., 2005). Education is required to alter established food selection habits among U.S. dental patients therefore, assistance-including nutrition-related training will be required if the refugees are being exposed to U.S. foods for the first time (Willis et al., 2005). Once introduced in the diet, sugary snacks can have negative impact on their oral health.

A program is needed to guide the Sudanese refugees that had the extractions through the rituals, providing information on ways they can improve their oral health status in the United States after dental restoration for themselves and their family. Information on proper oral hygiene after dental restorations is necessary for these individuals since they no longer have access to traditional hygiene materials like the chewing sticks. Comprehensive Western oral hygiene training will provide individuals with the tools to maximize oral health in this new cultural context (Willis et al., 2011). Using the information collected from the published studies, an oral hygiene program can be created and dedicated to the Dinka and Nuer tribes of Sudanese refugees. In order for the program to be effective, one must be mindful of the targeted audience to ensure full
participation. A sample oral hygiene program plan that is dedicated to the Dinka and Nuer tribes of Sudanese refugees is provided below.
PROPOSED PROGRAM PLAN

Goals and Objectives:

The program should include a PowerPoint presentation, demonstrations, and class participation to keep the audience involved. The goal of the program would be to educate adult Sudanese refugees from the Dinka and Nuer tribes who have restored their ritually extracted anterior dentition bridging the "knowledge gap between traditional and U.S. oral hygiene practices in order to maintain their newly restored dental health status and to prevent further decline in dental health status" (Willis et al., 2011).

The content of the presentation should consist of good oral hygiene practices including basic brushing and flossing techniques, good nutrition habits, dental care resource availability, and lastly an oral screening done after the presentation. This program will emphasize that proper oral health care is needed to prevent oral diseases, especially after their dental restoration. During this program, the Dinka and Nuer Sudanese refugees will learn:

1. Basic oral hygiene practices.
2. Transition of diet to good nutrition habits to avoid oral diseases.
3. Importance of keeping up with routine check-ups with dentists and resources.
4. Receive their current oral health status through screening.
The targeted audience would be adult Sudanese refugees (from the Dinka and Nuer tribes) who had dental restoration to replace missing teeth that has been ritually extracted. The information from the presentation can also benefit the refugee’s family members. The audience will consist mainly of adults since this type of extraction is commonly seen among this age group now. These adults can ultimately pass the knowledge gained to their children and other family members.

The language barrier must be considered for the program. This population of refugees knows little to no English so this program should be administered by an interpreter for whom Dinka or Nuer was a first language and a dental professional who is used to providing care to refugees. Dinka and Nuer are mostly oral languages and few of the participants could read their first language (Willis et al., 2011). Since English is not the first language for many of the refugees, the presentation should be short and be very simplified.

**Methodology:**

The program administrator must be knowledgeable about the Sudanese’s culture, their past and current oral health practices after dental restoration. Throughout the program the administrator should engage the audience by
asking questions to make the session interactive but also to get a feel for their current oral health practices. The program administrator should encourage the audience to ask as many questions they may have during the slideshow presentation to maximize the knowledge obtained in the program. Because both the Dinka and Nuer utilize limited technology and retain the knowledge to produce nearly everything by hand, the learning curve once in the U.S. is great (Willis et al., 2011). Therefore, the curriculum should remain basic. A sample curriculum should go as follows:

1. Pre Test
2. Importance of Good Oral Health
3. Oral Health Issues
4. Basic Oral Hygiene Practices
5. Eating a Balanced Diet
6. Dental Cleanings & Exams
7. Resources
8. Post Test & Review
9. Oral Screening

During registration, a folder should be distributed to each participant containing handouts, brochures, and it will be labeled with a number to determine the order of participants for the screening. The documents should be visually appealing and used pictures when possible. Handouts should be provided as guides for proper brushing and flossing techniques when at home.
The oral hygiene program will consist of videos and a slideshow to keep the program interactive.

Dinka and Nuer native speakers should be interpreters should help facilitate and translate the oral hygiene program. One interpretation method that has proven to be effective in a past study is where the primary investigator should read the question in English and the native speaker will then translate the question into the participant’s primary language (Willis et al., 2011). Participants then respond in their primary language and the interpreter translates the response into English again for the administrator (Willis et al., 2011). This method may prolong the entire program so it would be better if the program administrator is someone who can speak their native language. The interpreter/program facilitator should be provided the slide presentation in advance so s/he can be familiar with the terms before the presentation and provide any suggestions for modifying the program.

The pre- and post- test is used as instruments of evaluation (Figure 7). Through the pre- and post- test, the program should be evaluated to determine the effectiveness of the overall program. The evaluation instrument should consist of multiple questions and one true or false question to avoid complications of any language barriers. The questions that should be used
should include basic oral hygiene practices, how poor diet contributes to oral disease, and visiting the dentist.

The interpretation method mentioned above can also be implemented for the pre- and post-tests. At the beginning of the program, the audience can complete the pre-test with the aid of the interpreter who can clarify any unfamiliar terms. A post-test should be given to see what knowledge they have gain through the program. Afterwards, there should be a review of the answers of the post-test to initiate discussion on the frequently wrong answers. Also, the results of the post-test should be used to look for areas of improvement for the next presentation.
Pre/Post Test Your Knowledge
Oral Hygiene Training

This pre-test will quiz you on basic oral hygiene practices. Please circle ONE answer for each the question. If you need help with this pre-test, please raise your hand and the interpreter will come to your aid.

1. What is cavities a result of?
   a. Tooth decay
   b. Over brushing the teeth
   c. Eating healthy
   d. All of the above

2. Plaque is mainly caused by foods containing?
   a. Protein
   b. Carbohydrates (sugar and starch)
   c. Fats
   d. None of the above

3. What is the main cause of gum inflammation?
   a. Plaque buildup
   b. Brushing teeth too much
   c. Flossing teeth
   d. None of the above

4. When should you replace your toothbrush?
   a. Every year
   b. Every month
   c. Every 3 months
   d. Never

5. What material is used for cleaning in between teeth?
   a. waxy floss
   b. dental pick
   c. dental stick
   d. All of the above

6. Which food is NOT beneficial to oral health?
   a. Breads and cereals
   b. Fruits and vegetables
   c. Sugary snacks
   d. Fish and Poultry
### Pre/Post Test Your Knowledge

**Oral Hygiene Training**

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
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<tbody>
<tr>
<td>7. When should you visit the dentist for regular dental cleanings and</td>
<td></td>
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<tr>
<td>exams?</td>
<td>a. Every 6 months</td>
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<td></td>
<td>b. Every 2 years</td>
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<tr>
<td>8. How often should you brush your teeth?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Twice every day</td>
</tr>
<tr>
<td></td>
<td>b. Once every day</td>
</tr>
<tr>
<td>9. How often should you floss your teeth?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>a. Once per month</td>
</tr>
<tr>
<td></td>
<td>b. At least once every day</td>
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<tr>
<td>10. True or False: Using toothpicks to clean in between teeth can irritate the gums.</td>
<td></td>
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</table>

**Figure 7. Pre and Post Test for the Oral Hygiene Program.** This questionnaire should be provided to participants upon arrival for the oral hygiene program and then at the conclusion of the education. Comparison of results will allow for changes to be made to improve the process.
At the end of the slide presentation, several dental professionals or anyone who is trained will conduct an oral screening to access current oral health status for each refugee. The participants will then learn about their current oral health status. After the screening, each participant should be referred to a local dental practice or clinic that has a sliding fee scale to receive appropriate care.

There are other considerations that the program coordinator should consider to guarantee an effective program. The program should take place at a community center that aids Sudanese refugees so they will be familiar with the staff, and continue using this center as a future resource. The program also should be in conjunction with a dental clinic that is familiar with providing dental care to refugees. The group size for the program can vary due to the specific nature of the topic but it can be up 25 people in order to allow time to screen every participant. It should be held on a weekend in the afternoon to minimally avoid work schedule conflicts and to adjust to family members schedules. Also, all those who have received proper dental restoration of the anterior teeth should be included as well as other family members interested in learning about oral health diseases and prevention.
CONCLUSION

Due to the ritualistic anterior dentition removal, Sudanese refugees from the Dinka & Nuer tribes have oral health disparities that include malocclusion, chewing, simple biting, and speech articulation. The published studies provided information on the current oral health status and practices of the Sudanese-Dinka and Nuer refugees and the benefits of dental restoration. A sample oral hygiene program was developed in given to endure increase the oral health status of this population. Healthcare professionals should use this study as guide for creating an oral hygiene program that will specifically meet the needs of the Sudanese refugees from the Dinka and Nuer tribes.
REFERENCES


