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Diagnosed Eating Disorders in the U.S. Military: A Nine Year Review

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The objective of this study was to determine the incidence of three types of eating disorders (ED); anorexia nervosa (AN), bulimia nervosa (BN) and eating disorder not otherwise specified (EDNOS), diagnosed in the U.S. Military. Diagnosed cases of ED were obtained from the Defense Medical Epidemiology Database for all Service Members (SM) from 1998–2006. The percentage per year of SM with an ED diagnosis was .30%. Eating disorders were diagnosed significantly more in 2006 (.41%) compared to 1998 (.23%) ($p < .001$). Females were diagnosed significantly more than males ($p < .001$). The majority of AN cases (66%) were in the Marines. This is the first known study to investigate the incidence of ED in SM using medical record data. Service Members diagnosed with ED have increased. Females, specifically White females, have higher incidence of ED. The reported incidence of diagnosed ED in SM was lower compared to previous research.

Eating disorders (ED) are a group of disorders characterized by disturbed eating habits and a distorted view of one's body weight that usually develops in adolescence, between 15–18 years of age (APA, 2000; Becker, Grinspoon, Klibanski, & Herzog, 1999). Becker et al. reported

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that annually, approximately 5 million Americans suffer from an ED (Becker et al., 1999). However, it is estimated that half of all ED cases go undiagnosed (ANAD, 2007; Becker et al., 1999; NEDA, 2002b). A greater number of ED cases are observed in the elite athlete population, 8% and 20% for males and females respectively (Sundgot-Borgen & Torstveit, 2004). Categorized by the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM IV) as a psychiatric illness, ED has many etiologies.

There are many causes usually acting symbiotically that lead to the development of an ED. Constant media attention given to waif-like models and actors can act as a trigger for the onset of some (Field, Camargo, Taylor, Berkey, & Colditz, 1999; Field et al., 2001; Harrison, 2000). The current societal notion that thinness equals beauty is negatively affecting people's outlook on healthy eating and lifestyle management. This view has an especially large impact on young females who, from an early age, are exposed to the great attention given to a person's weight via various media. Magazine covers, television shows and commercials are inundated with pictures of thin and apparently happy models, athletes and actors. Thus, ED can develop due to a person's desire to look like these emaciated celebrities (Field, Camargo, Taylor, Berkey, & Colditz, 1999; Field et al., 2001; Harrison, 2000).

An ED may also develop due to the internal or external pressures that coexist with their chosen profession or extracurricular activities. Some elite athletes perceive that a lower body weight and leaner frame will increase performance (NEDA, 2002a; Smith, 1996). The struggle for optimal performance, as well as the desire to appear in better shape than competitors, leads to a higher percentage of ED cases in athletes when compared to the general population (Sundgot-Borgen & Torstvet, 2004). When an athlete participates in a sport that possesses an aesthetic component (e.g., gymnastics, figure skating and cheerleading), an even higher number of ED cases is documented (Byrne & McLean, 2002; Davison, Earnest, & Birch, 2002; Sundgot-Borgen, 1994). In addition, individuals participating in certain professions such as modeling, gymnastics, diving, body building, wrestling, dancing and military service have, whether formally or informally, a weight standard that must be met (NEDA, 2002a).

An ED may also develop after experiencing a life altering event (Center, 2005). During adolescent years, teenagers experience a number of changes that affect them both physically and emotionally. It is during these years that many teens are making life changing decisions and planning for their future. Some are preparing for college while others are seeking employment. There is also another group contemplating joining the Military. Joining the Military is a life-altering event and for those already at risk, partaking in this physically and mentally demanding profession may act as a trigger for the onset of an ED.

Warner et al. (2007) conducted a self-report survey based study that estimated ED among U.S. Service Members (SM) at 10%. This estimate is higher than the National Average of 3 to 4% (Hudson, Hiripi, Pope, &

Kessler, 2007; NEDA, 2002b), but comparable to elite athletes (Sundgot-Borgen & Torstveit, 2004). Both SM and elite athletes have physically demanding jobs and must maintain a certain level of fitness and meet weight standards. Furthermore, these standards in SM must be met twice per year in all branches of the military, except for new recruits who have up to one year to meet weight requirements (El Nasser, 2007). If the standards are not met, the SM is placed in a remedial fitness program. Many times, these programs are plagued with an unfavorable stigma that can lead to those enrolled being ostracized by other SM. In addition, if fitness and weight standards are not met, SM can be placed on a non-promotable status and become ineligible for certain training programs (Army, 2006).

Athletes and SM may recognize that a leaner body may increase performance; however, when efforts to attain a thinner physique entail severe bouts of under nourishment, performance decrements and increased risk of injury can result (Sherman, Thompson & Rose, 1996). Those suffering from an ED are at a greater risk for physical and mental ailments including: cardiac complications, intestinal dilation, hypokalemia, anemia, hypercortisolemia, peripheral neuropathy, fatigue, osteoporosis, stress fractures obsessive compulsive disorders and depression (Becker et al., 1999; Hall, 2003). Experiencing one of these injuries can have deleterious effects on the performance of a SM during training and, more importantly, in combat.

There are few studies evaluating ED in the military. Most of the published data have been obtained using self-report surveys; however, the results of these studies vary widely. According to these surveys, SM meeting the criteria for an ED range from approximately 8 to 72% in females (Lauder & Campbell, 2001; Lauder, Williams, Campbell, Davis, & Sherman, 1999; McNulty, 1997a, 2001; Warner et al., 2007) and 7 to 51% in males (McNulty, 1997b; Warner et al., 2007). It is unknown what percentage of those meeting the criteria for an ED are being evaluated in military medical clinics. Therefore, the purpose of this study was to use medical record data to determine the incidence rates based upon actual diagnosis of three types of ED, anorexia nervosa (AN), bulimia nervosa (BN) and eating disorder not otherwise specified (EDNOS) in the U.S. Military.

METHODS

The protocol was reviewed and approved by the Institutional Review Board at the United States Research Institute of Environmental Medicine. A preexisting medical surveillance database was used to determine the incidence of ED in the military. The study was designed as an epidemiological retrospective investigation in which ambulatory visits were the primary type of data used. Data obtained from the Army, Air Force, Navy and Marines from 1998–2006 were evaluated.

Defense Medical Surveillance System

The Army Medical Surveillance Activity (Aberdeen Proving Ground, MD) gathers data to be included in the Defense Medical Surveillance System (DMSS). Certain DMSS information can then be accessed through the Defense Medical Epidemiology Database, version 3.6.4 (DMED). This database contains up-to-date and historical data on those in the Military related to medical events (e.g., hospitalizations, outpatient visits) and personal characteristics (e.g., age, gender, race, and rank) for the past 10 years. This data can then be used to integrate and analyze military personnel and medical event data from all services (Army Medical Surveillance Activity, 2004).

DMED provides data relevant to an active duty SM: demographic, inpatient hospitalization, and ambulatory data. Demographic data includes age, gender, race, marital status, and rank. These are provided monthly by the Defense Manpower Data Center (Army Medical Surveillance Activity, 2004). Hospitalization data are a subset of information from the Standard Inpatient Data Record (SIDR), which records inpatient treatment data. SIDR data are collected by the Composite Health Care System, which is used in worldwide Department of Defense military treatment facilities. When an active duty SM is hospitalized in a military treatment facility, diagnoses are recorded using the International Classification of Diseases, 9th Revision (ICD-9) code at the time of discharge (Army Medical Surveillance Activity, 2004). The Standard Ambulatory Data Record records outpatient treatment data generated by the Medical Treatment Facilities and outsourced, non-Department of Defense clinic outpatient healthcare provided to active duty SM. A subset of information from this is used for ambulatory data (Army Medical Surveillance Activity, 2004). Diagnoses are recorded using the ICD-9 code(s) for each outpatient visit by an active duty SM.

Definition of Eating Disorder

Three types of ED were examined; AN (ICD-9 code: 307.1), BN (ICD-9 code: 307.50), and EDNOS (ICD-9 code: 307.51). Anorexia Nervosa is diagnosed in adults as the inability to maintain 85% of normal body weight, a fear of gaining weight although underweight, a distorted body image and amenorrhea. Bulimia Nervosa is diagnosed as a cycle of binge eating and purging that occurs twice a week for at least three months. Lastly, EDNOS is described as an ED that does not meet all the criteria to be called either AN or BN (e.g., criteria for BN except purging less than twice per week for three months) (APA, 2000).

Data Extraction and Analysis

Demographics to include gender (Male or Female), rank (Enlisted or Officer), race (White, Black or Other) and service (Army, Air Force, Navy,

TABLE 1 Average Demographics of the Total Population from 1998–2006

	Military	Army	Navy	Air Force	Marines
% of Population	100.00%	34.77%	26.70%	25.96%	12.57%
Gender					
Male (%)	85.50%	85.15%	86.20%	81.09%	94.12%
Female (%)	14.50%	14.85%	13.80%	18.91%	5.88%
Age					
<20 (%)	8.19%	8.03%	7.69%	5.73%	14.77%
20–24 (%)	32.49%	32.03%	31.33%	27.39%	46.67%
25–29 (%)	20.56%	21.91%	20.58%	20.52%	16.84%
30–34 (%)	15.16%	15.94%	15.53%	16.47%	9.53%
35–39 (%)	13.60%	12.70%	14.33%	17.06%	7.41%
> = 40 (%)	10.01%	9.39%	10.54%	12.84%	4.79%
Race					
White (%)	70.39%	64.37%	69.79%	76.90%	75.00%
Black (%)	19.99%	25.65%	19.28%	15.77%	14.46%
Other (%)	9.62%	9.98%	10.93%	7.33	10.55%
Rank					
Enlisted (%)	83.92%	83.66%	85.34%	80.12%	89.48%
Officer (%)	16.08%	16.34%	14.66%	19.88%	10.52%

or Marines) of the military population during the years 1998 to 2006 were obtained from the DMED database (Table 1). Data from 2007 was incomplete, and therefore excluded. Unpaired t-tests were conducted on the identified ICD-9 codes for the total military and for the Army, Navy, Air Force and Marines to investigate any significant differences between the sex, rank, or race of those clinically diagnosed with an ED. Trends were also examined for differences in rates for the entire military and each branch of service over time. All analyses were performed using the statistical package SPSS version 15.0 (SPSS, Chicago, IL). Significance was set at $p < .05$.

RESULTS

Total Military

From 1998 to 2006, there were approximately 1,179,181 males and 201,607 females serving in the U.S. Military per year (Table 1). Over the nine years, the average medically diagnosed ED rate per year was .30% in the military. Specifically, incidence rates for AN, BN, and EDNOS were .04%, .13% and .13% respectively. The ED rate significantly increased from 1998 to 2006 ($p < .001$) (Figure 1).

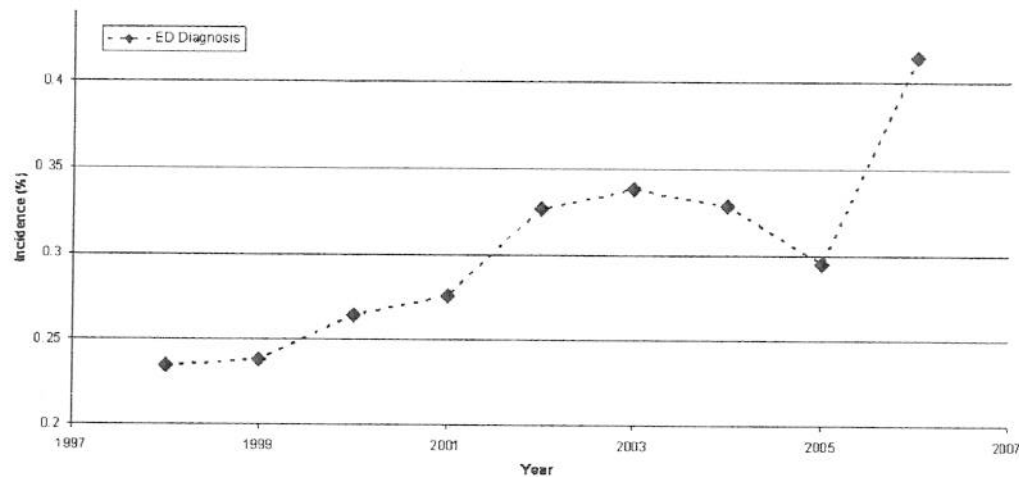


FIGURE 1 Incidence of diagnosed ED in the military (1998–2006).

For the entire military, each of the three types of ED made up one third of diagnosed cases (Figure 2A). However, certain types of ED had a greater effect on the number of reported cases in each branch of service. For example, Marines represented the highest majority of diagnosed AN cases (Figure 2B), and the least amount of BN and EDNOS cases compared to the other branches of service (Figure 2B–D).

Evaluating the differences in demographics in the military revealed female SM were diagnosed with AN, BN and EDNOS rates of .25%, .79%

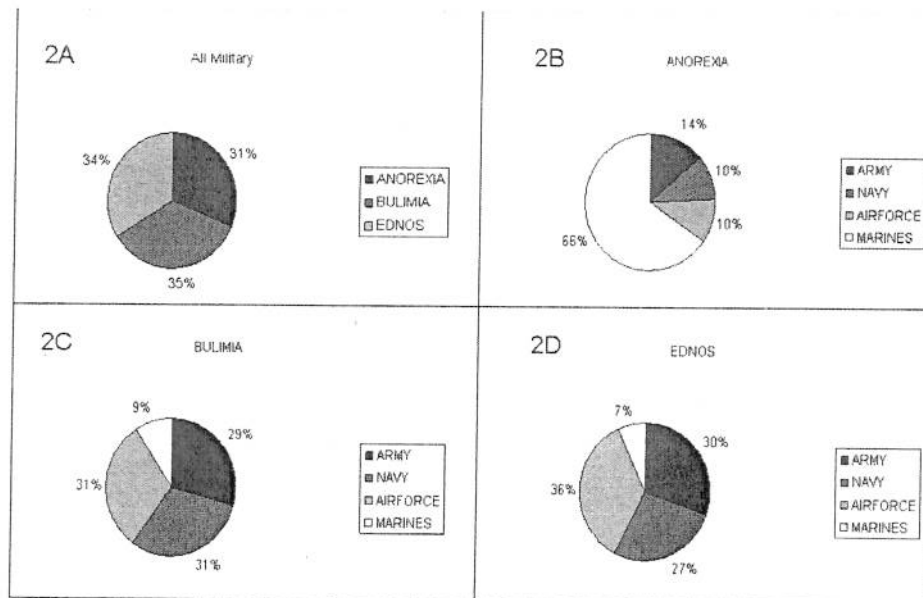


FIGURE 2 Incidence of eating disorder diagnoses broken down by branch of service (1998–2006).

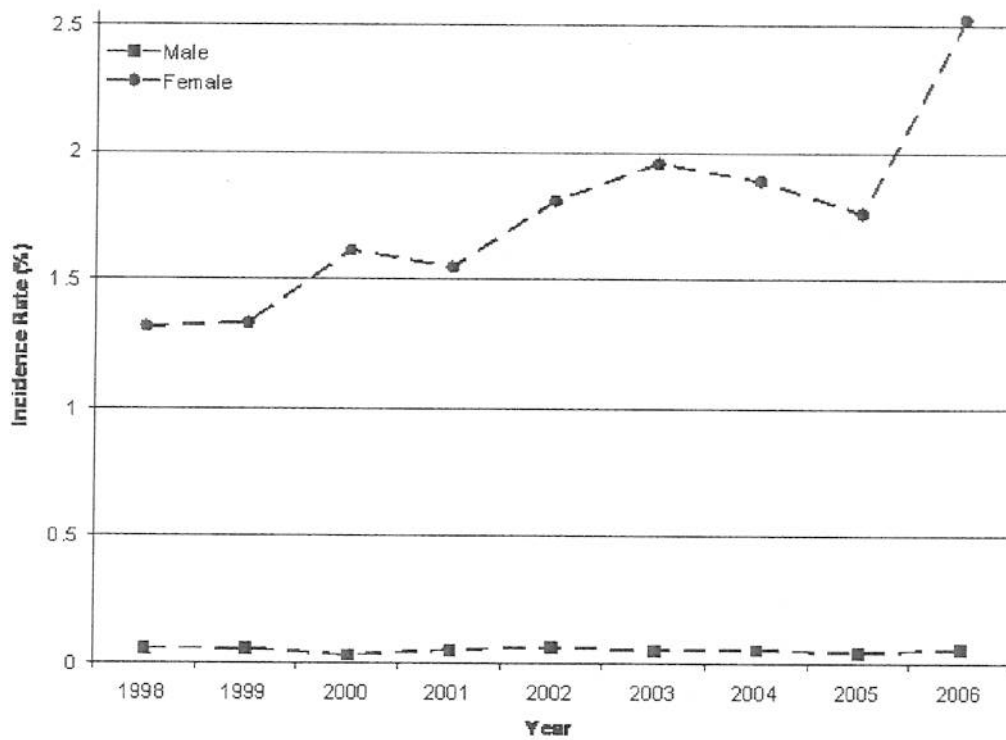


FIGURE 3 The yearly incidence rate of male and female Service Members diagnosed with an eating disorder.

and .72% respectively. Male SM, were diagnosed with AN, BN and EDNOS rates of .01%, .02% and .03% respectively. Female SM were diagnosed significantly more ($p < .001$) than males and made up 85% of diagnosed ED cases (Figure 3). The majority of ED cases diagnosed in females were categorized as BN (45%) while 52% of male cases fell into the EDNOS category. White SM had a significantly higher ED diagnosis rate when compared to SM of any other race ($p < .01$) and white female SM had a significantly higher rate of diagnosed ED cases than females of any other race ($p < .05$). There were no significant differences in diagnosis between officer and enlisted ranks.

Army

There was an annual population of approximately 410,023 males and 71,607 females in the Army each year from 1998 to 2006. The average ED diagnosis rate per year during this time was approximately .03%. Female Soldiers were diagnosed at a significantly higher rate than males ($p < .001$) and White female Soldiers had a significantly higher rate of diagnosed ED cases than female SM of other race ($p < .05$). Over the nine years evaluated, the average incidence rate per year for ED in female soldiers was 1.39%. White

Soldiers were diagnosed significantly more than any other race ($p < .001$). Female Army Officers had a significantly higher rate ($p < .05$) of ED than enlisted female Soldiers.

Navy

There was an annual population of approximately 315,885 males and 51,278 females serving in the Navy each year from 1998 to 2006. The average ED diagnosis rate per year during this time was approximately .04%. The Navy had one of the highest cases of BN diagnoses in the military (Figure 2C). White Sailors had a higher ED diagnosis rate compared to Black Sailors ($p < .001$). Sailors of other races were diagnosed at a higher ED rate compared to White Sailors ($p < .05$) and Black Sailors ($p < .001$). Female Sailors were diagnosed at a significantly higher rate than their male counterparts ($p < .001$) and White female Sailors had a significantly higher rate of diagnosed ED cases than female Sailors of other races ($p < .05$). Over the nine years reviewed, the average ED diagnosis rate per year for females in the Navy was 2.07%. There were no significant differences between officer and enlisted ranks.

Air Force

There was an annual population of approximately 289,468 males and 68,348 females serving in the Air Force each year from 1998 to 2006. The average ED diagnosis rate per year during this time was approximately .03%. Overall, the Air Force represented approximately one of the highest percentages of BN cases and the highest percentage of EDNOS cases in the military (Figure 2C and 2D). White Airmen and women had a higher diagnosis rate of ED when compared to Airmen and women of any other race ($p < .05$). Overall, enlisted personnel had a significantly higher rate of ED diagnosis than officer personnel in the Air Force ($p < .01$). However, only female enlisted Airmen had a significantly higher rate of ED diagnosis than officers did ($p < .005$). Female Airmen also had a significantly higher rate of ED than males ($p < .001$). During this time, female airmen had an average ED rate of 1.83% and White female airmen had a significantly higher rate of diagnosed ED cases than female airmen of any other race ($p < .05$).

Marines

There was an annual population of approximately 163,802 males and 10,371 females in service per year from 1998 to 2006. The average ED diagnosis rate per year during this time was approximately .02%. As previously noted, Marines made up the highest percentage of diagnosed AN cases in the military

(Figure 2B). White Marines were diagnosed with ED at a higher rate than Marines of any other race ($p < .01$). Other races in the Marines had a higher rate of ED diagnosis when compared to Black Marines ($p < .01$). There was no significant difference in ED diagnosis between enlisted and officer ranks. The average ED diagnosis rate for female Marines was 2.55%. Female Marines had a higher rate of ED diagnosis than males ($p < .001$) and White female Marines had a significantly higher rate of diagnosed ED cases compared to Marines of any other race ($p < .05$).

CONCLUSION

This study determined the average yearly incidence rate of diagnosed ED in the military between the years of 1998 to 2006 was 0.30%. This finding is lower than rates reported in the general population, 3 to 4% and elite athletes, 8% and 20% for males and females respectively (Sundgot-Borgen & Torstveit, 2004). It is also lower than previous survey based studies conducted on SM (10%) (Warner et al., 2007). The results indicated that overall ED diagnoses were more common in White females but not service specific. However, specific diagnoses of ED, such as AN and BN appeared to be more prevalent in certain branches of service. Lastly, the results of this study suggest that diagnosed cases of ED in the military are increasing. Diagnosed ED significantly increased ($p < .001$) from 1998 (.23%) to 2006 (.41%).

The results of this study conflict with previous survey based studies investigating ED in the military not only in overall rates but also in the rates of each sex (Table 2). This study found 1.76% of female SM diagnosed with an ED compared to survey based studies which reported ED cases in females ranging from 8% to 72% (Lauder & Campbell, 2001; Lauder et al., 1999; McNulty, 1997a, 2001). It should be noted that these percentages include those with an ED as well as those at risk for developing one. Since few studies have been conducted on ED in males, it is difficult to make a valid comparison of survey based studies with the number of ED medically diagnosed. One study that has examined ED in male Sailors using surveys reported rates of 2.5% AN, 6.8% BN and 40.8% EDNOS (McNulty, 1997b). This was higher than the number found to be medically diagnosed in males (.06%).

The overall increase in diagnosed cases of ED in the military from 1998 to 2006 can be attributed to a variety of reasons. One reason could be the increase of female recruits. Previous research as well as this study have determined that females are at a greater risk for developing an ED than males. Currently, females make up 15% of military personnel and 20% of new recruits (NPR, 2007). As the population of the military shifts, and more females choose to serve their country by joining the military, the indices of illnesses affecting predominantly females should be recognized and further studied.

TABLE 2 Summary of Eating Disorder Studies in the Military

Branch of Service	Sex	N	Results	Study
Army ROTC	Female	310	20% met criteria for an ED	Lauder TD[21]
Army	Female	423	26% met at risk for an ED, 8% had an ED. Of those with an ED, 3% AN, 9% BN & 33% EDNOS	Lauder [22]
Navy	Female	706	1.1%, 12.5%, and 36% of the population met the criteria for AN, BN, and EDNOS respectively	McNulty [23]
Army, Navy, Air Force, Marines	Female	1278	1.1%, 8.1%, and 62.8% of the population met the criteria for AN, BN, and EDNOS respectively	McNulty P [24]
Navy	Male	1425	2.5%, 6.8%, and 40.8% of the population met the criteria for AN, BN, and EDNOS respectively	McNulty [25]
Army	Male & Female	1069	57.8% respondents attempted at some point to lose weight. 73.1% still trying to lose weight. 14.4% admitted 'fasting' for ≥ 4 weeks. 3% admitted bulimic tendencies to lose weight.	Rose [32]
Army	Male & Female	169	4.5% admitted self-induced vomiting to maintain weight standard	Sweeney [36]
Army	Male & Female	1090	10% met criteria for an ED (7% male, 30% female).	Warner [15]

Not only has there been a greater incidence of ED in females, but there has also been an increase in females diagnosed since 1998 (Figure 3). This is in contrast to male diagnoses which remained stagnant. Males seeking approval by fellow SM are less likely to admit that they have a disease commonly seen in females for fear of being cast out. In addition males who regard ED as a female disease are less likely to report an ED (Boodman, 2007). Another reason could be greater dissatisfaction felt by females toward their bodies (Cash, Winstead, & Janda, 1986). Women who are more dissatisfied with their bodies may experience self-esteem issues, putting them at greater risk for developing an ED.

Stress may be another reason for the increase. We are a nation at war and an increased number of SM are actively engaged in combat situations, a stressful and often traumatic environment (Driskell & Salas, 1996). The association between stress, specifically stress from a combat situation, and mental disorders such as post traumatic stress disorder, anxiety, and depression has been established (Board on Population Health and Public Health Practice & Institute of Medicine, 2008). An association has also been documented between stressful environments and a person's eating habits (Westen & Harnden-Fischer, 2001). Therefore, it can be postulated that the exposure to the stressful events of war could cause an increase in the number

of ED diagnosed in the military. This statement can be validated by data from Figure 1 which shows a sharp increase in diagnosed ED after 2001, the beginning of the US involvement in the War on Terror. As SM experience greater stress and mental trauma from their engagement in combat, they may begin to feel a lack of control over their own situation. As a form of compensation, they may increase their control elsewhere such as in eating habits.

The increase in diagnosed ED in the military may also be due to changes in entry weight requirements for active duty. Currently in the Army, new recruits may enter with a weight higher than the standard if they meet the fitness criteria. However, they must meet the weight standard within one year of entering into active duty or they will be discharged from service. It is unknown what measures SM are taking to lose excess weight.

There is a tendency for more disordered eating to be observed around the time of the biannual weight and fitness assessments (McNulty, 1997b). Rose et al. reported that more than half of all Army Soldiers go through a cyclical pattern of weight gain and loss and are unable to maintain an "ideal weight" throughout the year (Rose, Mahnke, Christensen & Askew, 1993). If assessments were required at more frequent or random time points, and more emphasis was placed on healthy weight loss and lifestyle changes, less disordered eating may occur. Conversely, if research is conducted around the biannual assessment period, these studies may not only find those who have an ED but also those at risk of having their disordered eating habits become a full blown ED.

In this study, Marines had the highest diagnosis of AN in the military, 66% of all cases, and the highest incidence of ED among female SM. This concurs with McNulty et al. who also reported female Marines at a higher risk for ED than females in other service branches (McNulty, 2001). As previously noted, Marines had the highest diagnosis of AN, and female Marines had the highest diagnosis of ED among all female SM. One potential reason for the high number of ED observed in the Marines could be due to the stringent body fat standards required to remain in the Marines. Unlike other branches of Service, the Marines do not change body fat standards as a person ages (Navy, 2002). Females, for example, must retain a body fat of 25% throughout her Marine career. To compensate for age-related metabolic decreases, more Marines, specifically females, may be developing an ED, namely AN, as a seemingly easier way to meet weight and body fat standards.

A disparity lies between the results of this study and previous survey-based research investigating ED in the military. One possible reason is the predicament that exists when attempting to formally diagnosis an ED. Many suffering from an ED become very secretive and attempt to hide their ED. When researchers, compared to medical professionals, conduct surveys and interviews some of the anxiety may be alleviated and SM may be more likely to disclose ED tendencies. The Department of Defense lists ED as a

psychiatric condition. Thus, if medically diagnosed with an ED, depending on the severity, a SM may be discharged from service (Force). This may affect the percentage of ED diagnosis in two ways. First, a person who wishes to remain in the military may be less likely to seek treatment for fear of the potential repercussions. In addition, military medical professionals may be hesitant to diagnosis an ED since this type of diagnosis is permanently inscribed on a SM's medical records for their entire military career and can pose potential future hindrances for promotions, trainings, etc.

In addition, many who suffer from an ED are unaware that they have a problem. There are a growing number of people today who perceive ED as a lifestyle, not a disease (Disorders, 2007; Taylor, 2002). When a SM is in the mindset that their behavior is normal, they may not be able to connect decrements in performance with irregular eating patterns. A perception of this lifestyle as normal will also decrease the likelihood of a SM seeking treatment, leading to less diagnosed cases than those that actually exist.

If an ED is left undetected, further injury and decreases in physical performance can occur. Educational programs regarding ED and its effects on performance in the military could prove beneficial. One such program has been implemented at the US Naval Academy (Manos, Carlton, de la Cruz, & Kelley, 2006). This is an example of positive preventative steps being taken to decrease the number of ED cases. While at the Academy, Sailors go through a three-level program that discusses the signs, symptoms and risks of ED. If more awareness and educational programs were available in the other branches of service, not only might the number of cases decrease, but also SM might be more responsive in seeking help for themselves and others.

This is the first known research conducted that investigates ED in the military based on a military surveillance medical database. The incidence rates based on confirmed diagnoses reported in this study are in contrast to previous research conducted in military settings that have only reported prevalence rates based on survey data. This emphasizes the need for better screening tools and techniques to recognize ED in the military.

Limitations

This study had several limitations in addition to the inherent limitations that accompany using large databases for research purposes. Using this database assumes that medical officials are using correct ICD-9 codes and diagnoses are based on DSM-IV criteria. In addition, the database queried only included visits from established military medical treatment facilities and outsourced non-Department of Defense healthcare provided to active duty SM. Information cannot be obtained if that SM was counted for additional diagnostic codes. Specific SM information, such as heights and weights, also

cannot be obtained from this website. The majority of data that has been recorded on ED in the military has been conducted using self report. Lastly, it is difficult to compare the results of self report studies to the results of those actually being evaluated in clinics. It is recognized that ED is a complicated disease where many sufferers do not seek treatment, thus leading to an imminent under-representation of cases being diagnosed compared to what may actually exist in the overall military. Prospective research efforts are recommended to determine more accurate methods of tracking those suffering from an ED.

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