

Symptoms and Pregnancy Outcomes Associated with Extreme Weight Loss among Women with Hyperemesis Gravidarum

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Abstract

Objective: To report the weight loss and associated symptoms experienced by a large cohort of women with hyperemesis gravidarum (HG).

Methods: Data were obtained from an HG website registry, where women with HG were recruited on-line. Respondents were included if they experienced at least 1 live birth >27 weeks' gestation. Extreme weight loss was defined as a loss of >15% of prepregnancy weight.

Results: Of the 819 women surveyed, 214 (26.1%) met criteria for extreme weight loss. These women were twice as likely to be Hispanic or nonwhite. Extreme weight loss ($p < 0.001$) was associated with indicators of the severity of HG, such as hospitalization and use of parenteral nutrition, and with multiple symptoms during pregnancy, such as gallbladder and liver dysfunction, renal failure, and retinal hemorrhage. Among all women surveyed, 22.0% reported that symptoms lasted throughout pregnancy; this finding was nearly twice as likely among women with extreme weight loss: 63 of 214 (29.4%) vs. 117 of 605 (19.3%) (OR = 1.73, 95% CI 1.2-2.5, $p = 0.003$). For some women, symptoms continued postpartum and included food aversions, muscle pain, nausea, and posttraumatic stress. Approximately 16% of babies were born prematurely, and 8% reportedly weighed <2500 g. Among women with extreme weight loss, 9.3% reported having a child with a behavioral disorder.

Conclusions: Extreme weight loss is common among women with HG, suggesting that HG is a form of prolonged starvation in pregnancy and that the long-term effects of this condition on women and their offspring warrant further investigation.

Introduction

HYPEREMESIS GRAVIDARUM (HG), severe nausea and vomiting of pregnancy, is responsible for the hospitalization of more than 59,000 pregnant women in the United States annually, with an incidence estimated from a hospitalized cohort to be approximately 0.5% of live births.^{1,2} Internationally, estimates of incidence vary greatly, ranging from 0.3% in a Swedish registry to as high as 10.8% in a Chinese registry of pregnant women.^{3,4} HG is the most common cause of hospitalization in the first half of pregnancy and the second most common cause of antenatal hospitalization during pregnancy overall, second only to preterm labor.⁵ Whereas

nausea and vomiting of pregnancy (NVP) affect at least 75% of all pregnant women, HG is the severe end of the clinical spectrum of NVP and can be associated with serious maternal and fetal morbidity, such as Wernicke's encephalopathy,⁶ fetal growth restriction, and even maternal and fetal death.^{1,7}

HG is commonly defined as extreme nausea and vomiting accompanied by a weight loss to at least 5% below prepregnancy weight.⁷ Because previous reports regarding HG have largely derived from population-based obstetrical data and from small case series, we continue to have a limited understanding of the extent of this weight loss and the presence and duration of related symptoms in women with HG. Here, we explore both maternal symptoms during pregnancy

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and postpartum and child outcomes associated with severe weight loss in a large group of affected women.

Materials and Methods

The nonprofit Hyperemesis Education and Research (HER) Foundation was established in 2002. As part of its mission, it has produced a registry for women with HG and has undertaken a variety of on-line surveys about their experiences. One extensive survey, which was offered from 2003 to 2005, questioned women regarding their symptoms and outcomes.⁸ Women interested in HG found the survey on the internet, and those eligible for the study considered themselves to have experienced HG, which was defined as significant weight loss and debility secondary to nausea and vomiting during pregnancy, typically requiring medications or intravenous (IV) fluids for treatment. All data analyzed in this study were derived from self-reports; subjects reported the occurrence of symptoms and diagnoses by choosing from a list. Although an initial version of the survey had been piloted and revised prior to data collection for this study, no formal exploration of the face validity of the items had been performed. No further qualitative assessment or individual follow-up was conducted.

Subjects were instructed to report on all pregnancies, and those women who had only fetal losses under 27 weeks' gestation were excluded to permit analysis of multiple outcomes in childhood. Thus, the remaining population, those women with at least one gestation of at least 27 weeks' duration (i.e., onset of the third trimester), was the basis of this study. This restriction allowed clarification of the denominator to improve interpretability of the results and reduce bias in the analysis of postpartum and child outcomes that might have occurred from the inclusion of pregnancies that did not reach viability. For this analysis, data from pregnancies that were lost or terminated before 27 weeks were not included, as they merited independent analysis.

As women reported on multiple pregnancies, data regarding the specific characteristics and outcomes of preg-

nancies were aggregated at the level of the woman. Thus, if the characteristic of interest was found in any one of her pregnancies, that characteristic was noted, and the proportion of women who had at least one pregnancy with that characteristic was reported. Odds ratios (OR) were adjusted for the number of pregnancies ≥ 27 weeks per woman. An adjustment for the number of pregnancy losses was initially performed but was found to be noncontributory to the outcomes of interest and eliminated.

Extreme weight loss was defined as a loss of $\geq 15\%$ of the prepregnancy weight in the pregnancy with the largest weight loss of all reported pregnancies. Because a large proportion of the women continued to have symptoms for the duration of pregnancy, for interpretability, weight loss was calculated only in pregnancies that progressed to at least the third trimester.

We examined the following characteristics for association with extreme weight loss: (1) demographic characteristics, (2) severity of HG, (3) symptoms during pregnancy, (4) postpartum symptoms, and (5) child outcomes.

All calculations were performed in SAS (v. 9.0, Cary, NC). Comparisons of continuous variables were performed with nonparametric methods, and comparisons of categorical variables were performed with chi-square with Yates correction. OR and 95% confidence intervals (CI) are provided. The study was approved through the Institutional Review Board of the University of Southern California Health Sciences Campus.

Results

A total of 865 women with HG completed the survey and provided information about specific characteristics of each of their pregnancies; 46 women (5.3%) never experienced a live birth, reporting only one or more pregnancy losses (either voluntary or spontaneous) under 27 weeks, and the remaining 819 women experienced at least one delivery ≥ 27 weeks. This latter group forms the study population for the rest of the analyses.

TABLE 1. CHARACTERISTICS OF WOMEN COMPRISING STUDY POPULATION BY PRESENCE OF EXTREME WEIGHT LOSS^a

Characteristic	All women (n = 819)	Women with extreme weight loss (n = 214)	Women without extreme weight loss (n = 605)	p value
Age (years)	32.2 \pm 5.4 (20.0–62.0)	31.8 \pm 5.4 (20.0–53.0)	32.3 \pm 5.4 (20.0–62.0)	0.166
Mean \pm SD (range)				
Body mass index	25.00 \pm 5.9 (13.3–68.3)	24.9 \pm 5.6 (16.9–49.3)	25.0 \pm 6.0 (13.3–68.3)	0.824
Mean \pm SD (range)				
Did not graduate from college	323 (39.4%)	87 (40.7%)	236 (39.0%)	0.733
Race/ethnicity	Hispanic, 31 (3.8%) Black, 20 (2.4%) White, 698 (85.2%) Asian, 16 (2.0%) Other, 54 (6.6%)	Hispanic, 14 (6.5%) Black, 7 (3.3%) White, 167 (78.0%) Asian, 5 (2.3%) Other, 21 (9.8%)	Hispanic, 17 (2.3%) Black, 13 (2.2%) White, 531 (87.8%) Asian, 11 (1.8%) Other, 33 (5.5%)	0.011
Residence for first pregnancy	U.S., 656 (80.1%) U.K., 57 (7.0%) Canada, 28 (3.4%) Australia, 40 (4.9%) Other, 38 (4.6%)	U.S., 165 (77.1%) U.K., 22 (10.3%) Canada, 4 (1.9%) Australia, 15 (7.0%) Other, 8 (3.7%)	U.S., 491 (81.2%) U.K., 35 (5.8%) Canada, 24 (4.0%) Australia, 25 (4.1%) Other, 30 (5.0%)	0.038

^aExtreme weight loss was defined as a loss of $\geq 15\%$ of prepregnancy weight in the pregnancy with the most severe weight loss of all reported pregnancies.

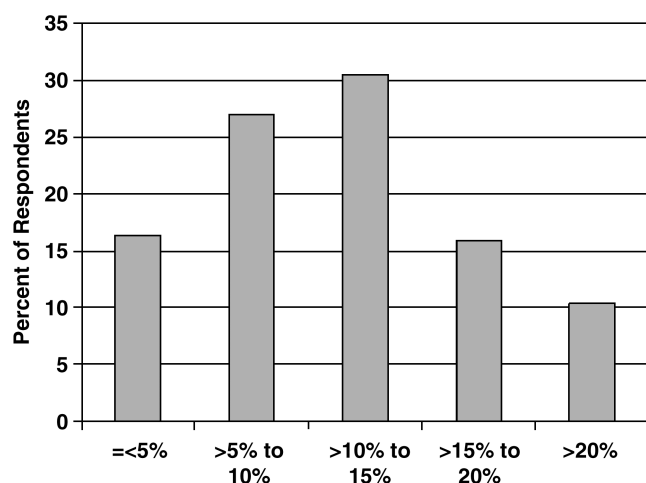


FIG. 1. Distribution of maximum weight loss among all reported pregnancies of gestational age ≥ 27 weeks, as a percentage of prepregnancy weight ($n = 819$).

Most of the respondents (80.1%) were American. Characteristics of the study population are reported in Table 1. At least one first-trimester or second-trimester spontaneous pregnancy loss was reported by 164 (20.0%) of the women; 72 (8.8%) reported at least one voluntary loss. Either a spontaneous or voluntary loss was reported for 207 women (25.3%). Of these, one third occurred in the second trimester. Of the 384 women reporting on multiple pregnancies of at least 27 weeks' duration, 366 women (95.3%) reported at least one recurrence of HG.

The distribution of the respondents' weight loss is shown in Figure 1. Extreme weight loss (loss $>15\%$ of prepregnancy weight) was identified in 214 women (26.1%) and was associated with treatment patterns typical of severe HG, including hospitalization, use of ondansetron (Zofran, GlaxoSmith Kline, Research Triangle Park, NC), IV fluids, and parenteral nutrition, and change of physician in order to improve the treatment of their nausea and vomiting (Table 2).

Extreme weight loss was also associated with multiple symptoms of HG occurring during pregnancy. Selected symptoms are shown in Table 3, and include excess salivation, anemia, gallbladder and liver dysfunction, hematemesis, muscle pain, confusion, renal failure, and retinal hemorrhage.

Women also reported on the duration of their symptoms. Half of the women (50.3%) stated that their worst symptoms occurred during the first 3 months of pregnancy. However,

22.0% of all women surveyed reported that symptoms lasted throughout pregnancy. Women with extreme weight loss were nearly twice as likely as other women with HG to continue to have symptoms throughout pregnancy: 63 of 214 (29.4%) vs. 117 of 605 (19.3%) (OR 1.73, 95% CI 1.2-2.5, $p = 0.003$). Some women reported that symptoms continued into the postpartum period, and many of these symptoms appeared to be worse for those with extreme weight loss (Table 3). These symptoms included postpartum gallbladder dysfunction, food aversions, muscle pain, nausea, and reports of posttraumatic stress. These women were more likely to report that recovery from their pregnancy took longer than 1 month.

For this study population, no statistically significant differences between those with and without Extreme Weight Loss were noted in newborn or child outcomes per the respondents' reports (Table 3).

Discussion

Our investigation is unique in that it reports on a large number of affected women, detailing the breadth and severity of the morbidity associated with HG, including symptoms and outcomes never previously reported. The spectrum of reported disease and physical disability is remarkable and is consistent with the current literature about the profound impact of this condition on affected women's daily lives.⁹⁻¹¹

Extreme weight loss ($>15\%$ of prepregnancy weight) was a common finding among women with HG, having been reported by 26% of respondents. Over 80% of women responding to the survey reported $>5\%$ loss of weight in their pregnancy with the most severe weight loss, and over 10% reported losing $>20\%$ of their prepregnancy weight.

Women with $>15\%$ weight loss were more likely to be hospitalized, require oral or IV therapy, or receive parenteral nutrition. These data support the use of weight loss as a manifestation of the severity of HG. This association of more severe weight loss with a more severe clinical picture may further support the use of weight loss in defining the severity of HG. Because HG has no specific characteristics that separate it from NVP other than its severity, a definition that includes the use of IV fluids or parenteral nutrition may be biased because of variance in standards of medical practice. Although a specified weight loss would also be affected by a woman's access to treatment, such a definition would be more likely to identify a symptomatically homogeneous group of women who may be studied based on severity defined by extreme weight loss. Such studies continue to be necessary because the etiology of HG remains elusive.¹²

TABLE 2. INDICATORS OF SEVERITY OF ILLNESS ASSOCIATED WITH EXTREME WEIGHT LOSS^a

Variable	Number (%) of women with extreme weight loss (n = 214)	Number (%) of women without extreme weight loss (n = 605)	Odds ratio (95% CI)	p value
Hospitalization	170 (79.4%)	317 (52.4%)	3.5 (2.4-5.1)	<0.001
Ondansetron (Zofran) use	137 (64.0%)	325 (53.7%)	1.5 (1.1-2.1)	0.010
Intravenous fluid use	182 (85.1%)	412 (68.1%)	2.7 (1.8-4.0)	<0.001
Parenteral nutrition use	72 (33.6%)	96 (15.9%)	2.7 (1.9-3.9)	<0.001
Change of physician	83 (38.8%)	134 (22.1%)	2.2 (1.6-3.1)	<0.001

^aExtreme weight loss was defined as a loss of $\geq 15\%$ of the prepregnancy weight in the pregnancy with the most severe weight loss of all reported pregnancies.

TABLE 3. MATERNAL MORBIDITY AND CHILD OUTCOMES ASSOCIATED WITH EXTREME WEIGHT LOSS^a

Variable	Number (%) of women with extreme weight loss (n = 214)	Number (%) of women without extreme weight loss (n = 605)	Odds ratio (95% CI)	p value
Maternal symptoms during pregnancy				
Insomnia	53 (24.7%)	98 (16.2%)	1.7 (1.2-2.5)	0.007
Excess saliva	91 (42.5%)	194 (32.1%)	1.6 (1.1-2.1)	0.007
Constipation	76 (35.5%)	160 (26.4%)	1.5 (1.1-2.1)	0.015
Anemia	78 (36.4%)	165 (27.3%)	1.5 (1.1-2.1)	0.015
Gallbladder dysfunction	25 (11.7%)	28 (4.6%)	2.7 (1.5-4.7)	0.001
GERD ^b	74 (34.6%)	178 (29.4%)	1.3 (0.9-1.8)	0.162
Hematemesis	73 (34.1%)	125 (20.7%)	2.0 (1.4-2.8)	<0.001
Hypotension	62 (29.0%)	96 (15.9%)	2.1 (1.5-3.1)	<0.001
Liver dysfunction	14 (6.5%)	10 (1.7%)	4.1 (1.8-9.4)	<0.001
Muscle pain	71 (33.2%)	105 (17.4%)	2.3 (1.6-3.4)	<0.001
Memory loss	22 (10.3%)	49 (8.1%)	1.3 (0.7-2.2)	0.385
Confusion	30 (14.0%)	54 (8.9%)	1.6 (1.0-2.7)	0.041
Mood changes	77 (36.0%)	169 (27.9%)	1.4 (1.0-2.0)	0.032
Oral bleeding	25 (11.7%)	44 (7.3%)	1.7 (1.0-2.8)	0.057
Renal failure	7 (3.3%)	4 (0.7%)	5.0 (1.5-17.3)	0.011
Retinal hemorrhage	16 (7.5%)	9 (1.5%)	5.2 (2.3-12.1)	<0.001
Stomach ulcer	8 (3.7%)	10 (1.7%)	2.3 (0.9-5.9)	0.085
Postpartum symptoms				
Postpartum recovery lasted >1 month	131 (61.7%)	316 (52.2%)	1.5 (1.1-2.0)	0.018
Anxiety	59 (27.6%)	163 (26.9%)	1.0 (0.7-1.5)	0.846
Depression	50 (23.4%)	122 (20.2%)	1.2 (0.8-1.8)	0.327
Digestive problems	58 (27.1%)	112 (18.5%)	1.6 (1.1-2.4)	0.008
Fatigue	117 (54.7%)	30.6 (50.6%)	1.2 (0.9-1.6)	0.328
Food aversions	85 (39.7%)	194 (32.1%)	1.4 (1.0-1.9)	0.050
Gallbladder dysfunction	28 (3.1%)	46 (7.6%)	1.8 (1.1-3.0)	0.023
GERD	56 (26.2%)	132 (21.8%)	1.3 (0.9-1.8)	0.200
Insomnia	57 (26.6%)	112 (18.5%)	1.6 (1.1-2.3)	0.014
Muscle pain	67 (31.3%)	133 (22.0%)	1.6 (1.1-2.3)	0.007
Nausea	40 (18.7%)	69 (11.4%)	1.8 (1.2-2.7)	0.008
Pancreatitis	5 (2.3%)	6 (1.0%)	2.3 (0.7-7.8)	0.166
Posttraumatic stress	48 (22.4%)	62 (10.3%)	1.5 (1.7-3.8)	<0.001
Stomach ulcer	8 (3.7%)	16 (2.6%)	1.4 (0.6-3.4)	0.408
Child outcomes				
Preterm delivery	36 (16.8%)	95 (15.7%)	1.1 (0.7-1.6)	0.749
Baby weighed <2500 g	16 (7.5%)	53 (8.8%)	0.8 (0.5-1.5)	0.539
Child with autism	4 (1.9%)	7 (1.2%)	1.5 (0.4-5.3)	0.506
Child with behavioral disorder	20 (9.3%)	33 (5.5%)	1.7 (1.0-3.1)	0.071
Child with birth defect	10 (4.7%)	20 (3.3%)	1.4 (0.6-3.1)	0.396
Child with colic	33 (15.4%)	97 (16.0%)	0.9 (0.6-1.4)	0.735
Child with emotional disorder	10 (4.7%)	19 (3.1%)	1.4 (0.6-3.2)	0.392
Child with GERD	26 (12.1%)	89 (14.7%)	0.8 (0.5-1.3)	0.313
Child with sensory disorder	4 (1.9%)	23 (3.8%)	0.4 (0.1-1.3)	0.123
Child with learning disorder	12 (5.6%)	24 (4.0%)	1.4 (0.7-2.8)	0.386

^aExtreme weight loss was defined as a loss of $\geq 15\%$ of the prepregnancy weight in the pregnancy with the most severe weight loss of all reported pregnancies.

^bGERD, gastroesophageal reflux disease.

Symptoms during pregnancy

Women with HG reported a variety of symptoms during pregnancy that appeared more prevalent in those with extreme weight loss. These symptoms included hematemesis, hypotension, liver and gallbladder dysfunction, muscle pain, renal failure, and retinal hemorrhage. Half of the women (50.3%) stated that their worst symptoms occurred during the first 3 months of pregnancy. Women with extreme weight loss were nearly twice as likely as other women with HG to continue to have symptoms throughout their pregnancy. Our

findings support those of Munch,¹³ whose qualitative study found that women reported being "much sicker" than they expected to be and that their HG "lasted longer" than they expected it would. Lacroix et al.¹⁴ found that the severity of HG peaked at 11–13 weeks, with only half of the women experiencing relief of nausea and vomiting by 14 weeks' gestation, 90% finding relief by week 22, and others remaining symptomatic up until 34 weeks. The authors urge caregivers to "avoid setting women up for anger and disappointment when the symptoms persist."¹⁴ Thus, it appears that the severity of symptoms associated with HG and their negative

consequences, for example, extreme weight loss, electrolyte imbalances, and malnutrition, may contribute to extending the length of symptoms.

Postpartum symptoms

Our study suggests that there are also long-term maternal consequences of HG. These women were more likely to report that recovery from their pregnancy took longer than 1 month. Some women continued to report that symptoms continued into the postpartum period, and many of these symptoms appeared to be worse for those with extreme weight loss (Table 3). These symptoms included postpartum gallbladder dysfunction, food aversions, muscle pain, nausea, and symptoms characteristic of posttraumatic stress disorder (PTSD). Some of these symptoms, such as food aversions, may be the result of behavior modification over the months of pregnancy, and others may be a sign of the marked nutritional deprivation these women undergo.

The stress associated with high-risk pregnancies generally^{15,16} and HG specifically^{17,18} is well-documented. To date, one study conducted by Maggioni et al.¹⁹ found factors related to PTSD postdelivery included medical problems during pregnancy, such as hyperemesis and antepartum hospitalization. Still, little is known about the long-term psychological impact of experiencing medically complicated pregnancies wherein threats to self and to the fetus are profound. Our findings point to the need for postdelivery research to explore the presence of any psychosocial consequences of HG, such as PTSD, impact on maternal-infant attachment, and impact on family/marital partner relationship strain.

Fetal, newborn, and child outcomes

Previous reports have documented an increased risk of fetal growth restriction among women with HG.^{20,21} Although differences with respect to fetal growth do not appear to be associated with weight loss in this study, approximately 16% of babies were born prematurely, and approximately 8% reportedly weighed <2500 g. It is important to note that an appropriate group of unaffected women for comparison was not examined; consequently, differences in neonatal outcome would be difficult to detect across the spectrum of those already reporting the severe condition that is HG. The same limitation is present for the other child outcomes that were reported, that is, behavioral and learning disorders. Most women participating in the study reported on infants or very young children, however, where it was too early to detect these problems. Thus, it is of particular interest that 9.3% of women with extreme weight loss reported having a child with a behavioral disorder. Such outcomes have been hypothesized to be because of the nutritional deprivation that can be associated with HG. Martin et al.²² found that children whose mothers reported nausea in middle or late pregnancy had lower "task persistence" at age 5 (a marker of attention span) and were viewed by teachers as having more attention and learning problems at age 12.

The severe weight loss and extended duration of symptoms demonstrated by many of the survey respondents suggest that HG may indeed be a form of prolonged starvation in pregnancy. Natural experiments such as the Dutch Hunger Winter of 1944–1945 and the Chinese famine of 1959–1961 provide evidence that starvation during preg-

nancy impacts the mental health of adult children. Specifically, higher rates of schizophrenia,^{23–25} schizoid personality disorder,²⁶ antisocial personality disorder,²⁷ and affective disorders²⁸ have been found among adults exposed to famine *in utero* compared with those born of mothers not so exposed.

The effects of prenatal programming may not end with the present generation. There is a 60-year-old body of literature documenting the importance of intergenerational factors in pregnancy outcomes.²⁹ Multiple authors are now hypothesizing the transgenerational transfer of the effects of undernutrition. Lumeij and Stein,³⁰ in a follow-up study of babies born to women exposed to the Dutch famine of 1944–1945, found that children born to mothers who had been undernourished as fetuses had birth weights 6% lower than those born to pre-famine controls. These results indicate that undernutrition may modify phenotype not only in the individual fetus but also in its offspring and perhaps in successive generations.

The potential effect of the undernutrition that is associated with HG, and potentially of NVP, has received little acknowledgment to date.³¹ Recognizing that HG is a form of prolonged starvation and malnutrition that has serious physical and psychological sequelae³² requires a conceptual shift from the long-held view that symptoms of severe NVP are unfortunate yet expected and temporary aspects of pregnancy for some women. Our study suggests that proactive monitoring and treatment of NVP and HG patients to prevent avoidable physical decline, especially into the range of extreme weight loss, is vital.

Need for proactive medical care

Proactive medical care is particularly important in light of some existing evidence that suggests HG patients often garner negligible attention from healthcare providers. In this study, over a quarter of women overall and over a third of women identified with extreme weight loss felt the need to change physicians because of HG. This finding is consistent with previous reports that many women with HG believe their symptoms are not taken seriously by the medical profession^{17,33} and illustrates the need for continuing efforts by the American College of Obstetricians and Gynecologists to educate its membership about treatment options.³⁴ Moreover, some women have reported a perceived delay in receiving an HG diagnosis and treatment, which they believed contributed to unnecessary exacerbations of symptoms and increased hospitalizations.³⁵ The finding that Hispanics and nonwhites were more likely to report extreme weight loss suggests that these groups may be among those less likely to receive adequate early diagnosis and treatment for HG. Poursharif et al.¹⁷ found that women with HG had fewer problems in subsequent pregnancies because they knew what to expect, and their provider was able to recognize the seriousness sooner and institute treatment earlier.

Study limitations

We recognize that, in this report, the large number of survey items may lead to an overestimate of statistical significance. However, we emphasize the exploratory and descriptive nature of this study, which is meant to contribute to future hypothesis generation and, for this reason, employed no statistical adjustment for multiple comparisons,

leaving the assessment of the importance of the findings to the reader. Furthermore, these data were produced from self-reports; consequently, they were limited with respect to the potential occurrence of recall bias, the lack of medical documentation of the diagnoses, a conceptual understanding of the multiple symptoms and outcomes as listed in the survey, and the assessment of weight loss during pregnancy. The lack of an obvious association of extreme weight loss with low birth weight raises a question about the accuracy of these self-reports. However, data were not available to explore fetal growth and maternal nutrition in the detail required to make a definitive assessment of this relationship.

Because of the relatively low incidence of HG, studying this population can be very costly because it takes a great deal of time and effort spent across numerous locations to secure cases. The internet is a contemporary method of garnering data and lends itself to obtaining larger sample sizes. This type of computer-mediated research provides an additional method to include isolated (e.g., sick, hospitalized), geographically dispersed (e.g., hospital, country) and stigmatized groups (e.g., HG patients) who are often underrepresented.³⁶ Despite these inherent limitations, this is the first report of symptoms and outcomes in such a large group of respondents with HG from around the world.

Conclusions

Using data collected from a large number of women with HG, we describe the breadth and severity of the morbidity associated with HG, including symptoms and outcomes never previously reported. Loss of >15% of prepregnancy weight (extreme weight loss) was experienced by 26% of survey respondents, and these women were nearly twice as likely to report that symptoms lasted throughout pregnancy. For some women, symptoms continued postpartum and included food aversions, muscle pain, nausea, and posttraumatic stress. Approximately 16% of babies were born prematurely, and 8% reportedly weighed <2500 g. Among women with extreme weight loss, 9.3% reported having a child with a behavioral disorder. The common occurrence of extreme weight loss among women with HG suggests that HG is a form of prolonged starvation in pregnancy and that the long-term effects of this condition on women and their offspring warrant further investigation.

Prenatal care practitioners should be aware of these symptoms and their potential effects on both the mother and the fetus, so that they can recognize affected women and provide appropriate medical treatments. In cases with severe weight loss and extended duration of symptoms, the burden of HG on the developing fetus and long-term consequences to both mother and child warrant further investigation.

Acknowledgments

This research was supported in part by the Intramural Research Program of the National Institute of Child Health and Human Development, National Institutes of Health, Department of Health and Human Services, contract number N01-HD-2-3342.

Disclosure Statement

No competing financial interests exist.

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