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The Association between a Recorded Diagnosis of Obesity and Clinically Significant Weight Loss in the Primary Care Setting: A Nationwide Registry

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Keywords
Obesity · Diagnosis · Primary care · Weight loss · Dietary intervention

Abstract

Introduction: Overweight and obesity (OW/OB) are underdiagnosed. The primary aim was to assess whether a diagnosis of OW/OB recorded by a primary care physician (PCP) is associated with clinically significant weight loss, compared to a missed diagnosis. The secondary aim was to investigate the association between OW/OB diagnosis and patient attendance at dietary consultations. ***Methods:*** This retrospective, observational cohort study was conducted using a nationwide healthcare database. The study included a random sample of 200,000 adults with BMI ≥25 kg/m^2, recorded on a primary care visit, between 2014 and 2020. Patients with prior diagnosis of OW/OB or obesity-related complications were excluded. The independent variable was OW/OB diagnosis recorded by the PCP immediately after BMI measurement. The outcome variable was ≥5% weight loss at a second weight measurement within 9–15 months. Multivariate regression analysis was applied. ***Results:*** Of the 200,000 people with OW/OB, 36,033 (18.0%) had a diagnosis of OW/OB, and 37,368 (18.7%) had a second body weight measurement, of which 7,635 (20.4%) lost ≥5% of their baseline body weight. The prescription rate of anti-obesity medication was 1.2% and did not differ between patients who achieved weight loss and those who did not. Those with a recorded diagnosis were 2.6 times more likely to visit a dietitian (odds ratio [OR] 2.57, 95% confidence interval [CI]: 2.56–2.64) and 2.5 times more likely to achieve weight loss (OR 2.53, 95% CI: 2.46–2.60). After adjusting for multiple confounders, including attendance at dietary consultation, people who received OW/OB diagnosis were 32% more likely to achieve weight loss (OR 1.32, 95% CI: 1.28–1.36, $p < 0.001$) compared to people with missed diagnosis. ***Conclusions:*** Recording a diagnosis of obesity among relatively healthy people is associated with clinically significant weight loss at 1-year follow-up, independent of attendance at dietary consultation. Early obesity diagnosis is a significant opportunity to promote weight loss in the primary care setting and may affect weight trajectory.

Introduction

Overweight, defined as BMI 25–29.9 kg/m^2 and obesity, defined as BMI ≥30 kg/m^2, are states of excess fat mass. These are chronic medical conditions associated with increased risk of morbidity and mortality [1]. Weight loss ≤5% is considered clinically meaningful, and accepted as a therapeutic goal by multiple professional

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guidelines [2]. Failure to timely diagnose overweight and obesity (OW/OB) is a public health concern, especially since rapid weight gain has been reported during young adulthood [3], and is associated with increased risk for metabolic complications and morbidity [4–6].

The primary care setting is viewed as a critical entry point to obesity healthcare [7]. The primary care physician (PCP) is uniquely positioned to diagnose, inform, and offer a stepwise intervention. Specifically, recording a diagnosis of OW/OB is a crucial step, which indicates recognition of OW/OB as a chronic condition by the PCP, payer, and patient. In addition, a diagnosis recorded in the electronic medical record may indirectly indicate that a discussion took place between the PCP and the patient regarding excess body weight, which may increase a patient's motivation and commitment to implement lifestyle modifications [8, 9].

In a previous study, a recorded diagnosis of OW/OB by the PCP was associated with higher rates of obesity care by the physician, in accordance with professional guidelines. These included referrals for metabolic screening, assessment for obesity-related complications, and offering intervention and follow-up [10]. Unfortunately, OW/OB diagnosis rates are relatively low, as less than 50% of individuals with obesity have a diagnosis of obesity recorded in their medical file [10–12]. Beyond its role as a health quality measure, minimal data support the association between recorded OW/OB diagnosis and clinical outcomes in primary care. Studying the clinical impact of OW/OB diagnosis per se is important for public health, especially given the high prevalence of OW/OB, high cost of drug therapy and limited coverage of anti-obesity medications by payers [13, 14].

The primary aim of the current study was to assess whether recording compared to not recording OW/OB coded diagnosis by the PCP is associated with clinically significant weight loss ≥5% after 1 year of follow-up. The secondary aim was to investigate whether a formal OW/OB diagnosis was associated with attendance at dietary consultations following the initial body weight measurement. To address these questions, we analysed a nationwide health maintenance organization database serving people in ambulatory setting.

Methods

Study Design and Population

The Obesity Diagnosis Study (ODiS) was a retrospective, observational study that used the electronic medical record database of Maccabi Healthcare Services (MHS). MHS is the second largest health maintenance organization in Israel, serving over 2.5 million people. The study population included adults, ≥18 years of age, with a BMI ≥25 kg/m^2, recorded during a primary care visit (the index event), between January 1, 2014, and December 31, 2020, as described previously [10]. People who received a recorded ICD diagnosis of OW/OB, had bariatric surgery, and/or were prescribed anti-obesity medications prior to the index event were excluded. Other exclusion criteria were: prior diagnoses of obesity-related complications based on the MHS registry of chronic diseases, including cardiovascular disease, chronic kidney disease, hypertension, and diabetes mellitus; coded diagnosis of impaired fasting glucose, hyperlipidaemia, or fatty liver disease [10]; prior diagnosis of obesity-associated cancer [15] according to the Israeli national cancer registry; recently filled prescription of antipsychotic drugs or systemic glucocorticoids known to cause weight gain; or childbirth within 6 months before and up to 9 months after the index event. The cohort included 326,181 eligible individuals. Using the SQL function newid(), a random sample of 200,000 people was taken as the final cohort, per the Institutional Review Board request (online suppl. Fig. S1; for all online suppl. material, see https://doi.org/10.1159/000542080).

The Exposure Variable

A formal diagnosis of OW/OB was defined if any of the following ICD-10 codes was recorded in the medical record by a PCP during or within 7 days after the index event: E66, E66.0, E66.2, E66.3, E66.8, E66.9.

Outcome Variables

The primary study outcome was categorized as: losing ≥5% of index body weight, losing <5% of index body weight, or missing body weight. The outcome variable was defined as positive if the patient achieved a clinically significant weight loss of ≥5% relative to the body weight recorded at the index visit, in accordance with published guidelines [7]. The second weight measurement was recorded by any member of the healthcare staff 9–15 months after the index visit. The second outcome variable was defined as positive when the patient had at least one visit with a registered dietitian within 9 months after the index visit. The total number of dietary consultations was also defined using a quantitative ordinal variable, as indicated.

Of note, all Israeli citizens have medical insurance covered by the state. Primary healthcare is delivered by physicians. The number of visits with the PCP is not

limited, and visits are usually scheduled per patient request (annual visits are not mandatory). Periodic body weight measurement is strongly advocated but not mandatory or reimbursed, neither is adding a diagnosis to the patient's medical record. Dietary consultations are covered by national health insurance and is the main intervention offered to patients with OW/OB. Anti-obesity medications were not covered by public health insurance during the study period, and prescription of these drugs was very limited [10].

Other Variables

Additional variables included sex, age, alcohol abuse, smoking status; calculated BMI, as recorded at regular clinic visits. Patient ethnic and religious background was categorized according to the residential address at the time of the index event, as non-religious-Jewish, Jewish orthodox, Jewish-observant, Jewish-Russian immigrant, or Arab. Socioeconomic status was based on residence at the time of the index event, coded on a 1 to 10 scale, as defined by the Israeli Bureau of Statistics [16]. Additional covariates were a visit to a PCP during the year before the index visit, prescription of anti-obesity medication within 30 days after the index visit, recording of an additional diagnosis at the index event other than OW/OB (i.e., reason for visit) and prediabetes, defined according to serum glucose value of 100–125 mg/dL or HbA1C 5.7–6.4% measured within 12 months before the index visit.

Statistical Analysis

Baseline characteristics and distributions of potential confounders according to the presence or absence of a recorded diagnosis of OW/OB, were presented as means and standard deviations for continuous variables and as frequencies and percentages for categorical variables. Chi-square tests and independent *t* tests were performed to compare the two groups for categorical and continuous variables, respectively. Univariate analysis of the distributions of the outcome variables and their components according to the presence or absence of a recorded diagnosis of OW/OB was conducted. Multivariate analyses to predict the primary outcome variable was performed by logistic regression after adjusting for potential confounders. Adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were calculated. The goodness of fit of the model was evaluated by the Hosmer-Lemeshow test. Level of significance was set at 0.05 and was two-tailed. Data were analysed with IBM SPSS version 28.0 (SPSS Inc., Chicago, IL, USA).

Results

The study cohort included a sample of 200,000 adults with a BMI ≥25 kg/m^2, who visited the primary care clinic in 2014–2020. Of these, 36,033 (18%) had a diagnosis of OW/OB recorded in their medical record within 7 days after their BMI measurement.

The study flow chart (online suppl. Fig. S1) and patients' characteristics (online suppl. Table S1) were previously published [10]. In brief, subjects who had a recorded diagnosis of OW/OB compared to those who did not were more likely to be female (55% vs. 41%, $p < 0.001$), have a higher BMI (30.9 vs. 28.1, $p < 0.001$) and younger age (34.6 vs. 38.1, $p < 0.001$). The study population was stratified according to OW/OB diagnosis, visits with a nutritionist, and clinically meaningful weight loss (Fig. 1). Less than 15% had at least one visit with a dietitian after the index visit. People who received a recorded diagnosis were more likely to have a visit with a dietitian (24.9% vs. 11.6%, $p < 0.001$). Less than 20% of the people had a second body weight measurement 9–15 months after the index event, with 3.8% achieving weight loss ≥5%, and 1.6% achieving weight loss ≥10% of their baseline body weight. Among those who received a diagnosis of OW/OB and saw a nutritionist, 7.1% achieved weight loss ≥10%, compared to 1.0% among those who did not have a recorded diagnosis and dietary consultation. Overall, patients who achieved a clinically significant weight loss of ≥5% were more likely to have received a diagnosis of OW/OB and have had at least one in-person visit with a nutritionist after their index visit (Table 1). In addition, they were more likely to be women, have younger age and higher BMI at index compared to those who did not lose ≥5% body weight. Prescription rate of anti-obesity medication was only 1.2% and did not differ between patients who achieved weight loss and those who did not.

Since most of the study population did not have a second body weight measurement, we assessed whether their baseline characteristics were different than those of the group who had a second body weight measurement. Patients with a second weight measurement, were more likely to have a recorded diagnosis of OW/OB at the index event (25.5% vs. 16.3%, $p < 0.001$) and more likely to have a visit with a dietitian after the index event (27.0% vs. 11.0%, $p < 0.001$; online suppl. Table S2). Overall, those who did not have a second body weight measurement were more likely to be male, have a lower BMI, lower rates of prediabetes and visits with a PCP in the previous year.

The association between patient characteristics and attendance at dietary consultations and is presented in

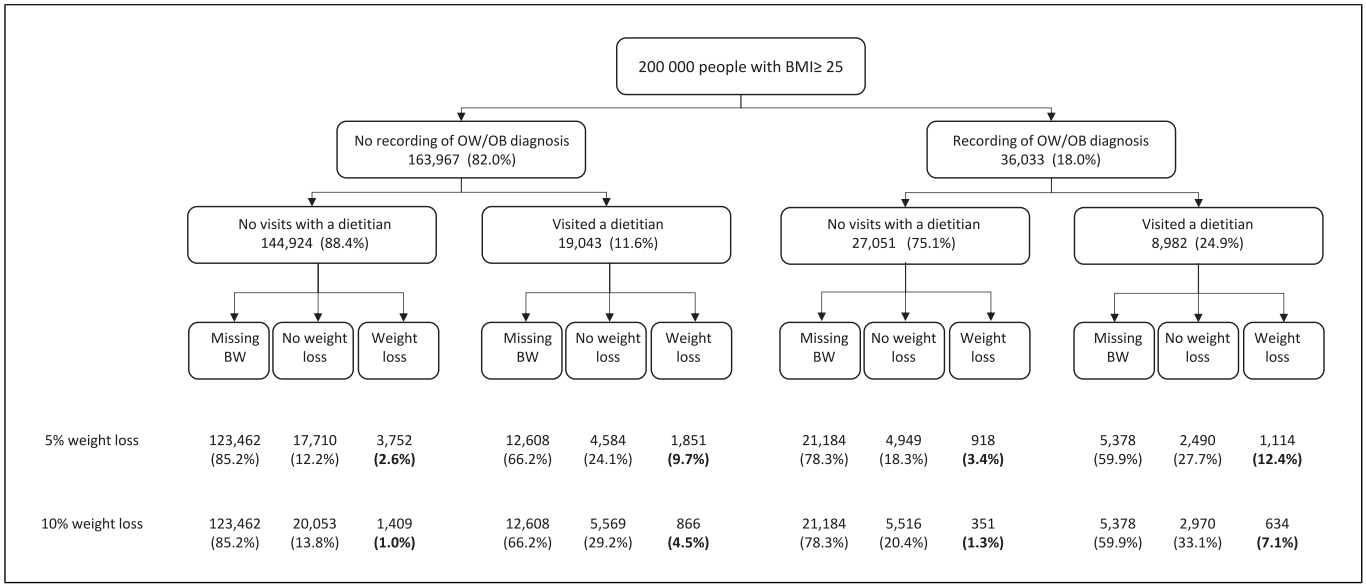

Fig. 1. Study population flow chart.

Table 2. People who attended a dietary consultation were more likely to be female, younger and have a higher BMI compared to people who did not visit a dietitian after the index event.

In exploratory analysis, when defining the outcome of dietary visits as an ordinal quantitative variable, we found that patients with multiple dietary consultations were more likely to be female, with younger age, higher BMI, and higher rates of prediabetes (online suppl. Table S3). There was an association between the number of consultations with a dietitian, the rate of recorded diagnosis of OW/OB, and the rate of achieving clinically significant weight loss (Fig. 2; online suppl. Table S4). Among those who had 7 or more dietary consultations, 41.6% had a recorded diagnosis of OW/OB and 36.4% achieved ≥5% weight loss, compared to 15.7% and 2.7% among those who had no dietary consultation, respectively ($p < 0.001$ for all trends).

In univariate logistic regression analysis, recorded diagnosis of OW/OB was associated with a 2.6-fold increase in the likelihood of having a visit with a dietitian, and 2.5-fold increase in the likelihood of achieving weight loss ≥5% at the second body weight measurement. In addition, a dietitian visit was associated with a 2.2-fold increase in the likelihood of achieving clinically significant weight loss (Fig. 3). In a multivariate regression model adjusted for potential confounders, including having a visit with a nutritionist, people who received a recorded diagnosis of OW/OB were with 30% more likely to achieve ≥5% weight loss compared to those who did not receive a diagnosis (OR 1.32, 95% CI: 1.28–1.36, $p < 0.001$; Fig. 4). Having a visit with a nutritionist was another strong independent predictor of the outcome variable (OR 1.98, 95% CI: 1.95–2.02, $p < 0.001$). BMI at baseline, female sex, and young age were all found to be independent predictors of weight loss at 1 year after the index visit.

Discussion

In this study, a diagnosis of OW/OB recorded by the PCP was associated with increased likelihood of achieving clinically significant weight loss ≥5% at 1-year follow-up. This relationship was partly mediated by in-person visits with a nutritionist, which was another strong predictor of weight loss. After adjusting the relationship for patient attendance at dietary consultation and additional covariates, having a recorded diagnosis of OW/OB was still associated with a 30% increase in the likelihood of achieving weight loss.

Data supporting the diagnosis of OW/OB as an independent predictor of weight loss are limited. Ciemins et al. [12] reported that having a recorded diagnosis of obesity was an independent predictor of 5% weight loss at 1 year of follow-up after initial body weight measurement in primary care clinics in the USA. Their cohort included patients with BMI ≥30 with two body

Table 1. Patient characteristics according to weight loss at follow-up

	Weight loss of 5% or more		*p* value
	no	yes	
	n = 29,733	*n* = 7,635	
Age, years	39.2 (14.5)	37.4 (14.8)	<0.001
Male gender, *n* (%)	13,702 (46.1)	3,262 (42.7)	<0.001
BMI, kg/m^2	29.0 (3.8)	30.7 (5.1)	<0.001
BMI category, *n* (%)			<0.001
25–29.9	20,749 (69.8)	4,239 (55.5)	
30–34.9	6,500 (21.9)	1,953 (25.6)	
35–39.9	1,897 (6.3)	909 (11.9)	
40≤	586 (2.0)	534 (7.0)	
Prediabetes, *n* (%)	1,544 (5.2)	404 (5.3)	0.73
Alcohol, *n* (%)	87 (0.3)	28 (0.3)	1
SES (points)	5.8 (2.5)	5.9 (2.6)	0.002
Ethnic and religious background, *n* (%)			0.06
Non-religious Jewish	21,246 (71.5)	5,529 (72.4)	
Orthodox-Jewish	2,704 (9.1)	679 (8.9)	
Russian-Jewish	2,070 (7.0)	520 (6.8)	
Jewish-observant	899 (3.0)	233 (3.1)	
Arab	2,959 (10.0)	674 (8.8)	
Visits PCP 1 year before, *n* (%)[a]	14,776 (49.7)	3,704 (48.5)	0.06
Anti-obesity drug, *n* (%)[b]	346 (1.2)	91 (1.2)	0.80
Visit with a dietitian, *n* (%)[c]	7,132 (24.0)	2,965 (38.8)	<0.001
OW/OB diagnosis, *n* (%)	7,482 (25.2)	2,023 (26.6)	0.012

Continuous variables are presented as mean (standard deviation). SES, socioeconomic status; OW/OB, overweight or obesity. [a]Individuals who had at least one visit with PCP prior to BMI measurement. [b]Anti-obesity medication was prescribed by the PCP within 30 days after the index visit. [c]Individuals who had at least one visit with a registered dietitian within 9 months after the index event.

weight measurements taken 9–15 months apart. In their report, 16.9% of the people achieved weight loss of at least 5% of their initial body weight. After adjusting for multiple covariates, including having a prescription issued for anti-obesity medication, recorded diagnosis at the first visit was associated with 30% increased likelihood of achieving weight loss ≥5% (OR 1.3, 95% CI: 1.2–1.3). The study cohorts differed considerably. Compared to the report by Ciemins et al. [12], the population in the current study included a higher percentage of men, had a younger mean age, 37 versus 55 years, most people on this cohort had BMI <30 kg/m^2 and no obesity-related metabolic comorbidities. Our results agree with those of Ciemins et al. and further extend our understanding that a diagnosis of OW/OB recorded by the PCP could be of clinical benefit, even among relatively young and healthy adults, without obesity-related complications. This may suggest that it is the diagnosis of OW/OB rather than its complications that could lead to patients' behavioural change and weight loss. Additionally, the relationship between OW/OB diagnosis and weight loss could only be explained partially by patients' attendance at dietary consultations.

A diagnosis recorded by the PCP indirectly indicates that the PCP has discussed the current body weight, which has been shown to increase a patient's motivation to implement certain lifestyle modifications [8, 9]. In a survey conducted among patients with obesity in the USA, most participants perceived a formal diagnosis of obesity by the PCP as a moderate to strong motivation for behavioural change, while receiving lifestyle recommendations from the PCP was perceived as a non-

Table 2. Patient characteristics according to attendance at dietary consultations after BMI measurement

	Attendance at dietary consultation		*p* value
	negative	positive	
	n = 171,975	*n* = 28,025	
Age, years	37.7 (13.6)	36.0 (13.5)	<0.001
Male sex, *n* (%)	102,571 (59.6)	10,979 (39.2)	<0.001
BMI (kg/m^2)	28.4 (3.3)	30.0 (4.1)	<0.001
BMI category, *n* (%)			<0.001
25–29.9 kg/m^2	130,152 (75.7)	16,746 (59.8)	
30–34.9 kg/m^2	32,208 (18.7)	7,156 (25.5)	
35–39.9 kg/m^2	7,243 (4.3)	2,723 (9.7)	
≥40 kg/m^2	1,888 (1.1)	1,279 (4.6)	
Prediabetes, *n* (%)	7,487 (4.4)	1,959 (7.0)	<0.001
Alcohol, *n* (%)	570 (0.3)	70 (0.2)	<0.01
SES (points)	6.0 (2.5)	6.3 (2.5)	<0.001
Ethnic and religious background, *n* (%)			<0.001
Non-religious Jewish	124,557 (72.4)	21,146 (75.5)	
Orthodox-Jewish	13,815 (8.0)	2,577 (9.2)	
Russian-Jewish	11,328 (6.6)	1,456 (5.2)	
Observant-Jewish	5,942 (3.5)	1,031 (3.7)	
Arab	16,333 (9.5)	1,816 (6.5)	
Visit with PCP, *n* (%)[a]	78,091 (47.7)	14,717 (52.5)	<0.001
OW/OB diagnosis, *n* (%)	27,051 (15.7)	8,982 (32.0)	<0.001

Continuous variables are presented as mean (standard deviation). SES, socioeconomic status; OW/OB, overweight or obesity. [a]Individuals who had at least one visit with PCP prior to BMI measurement.

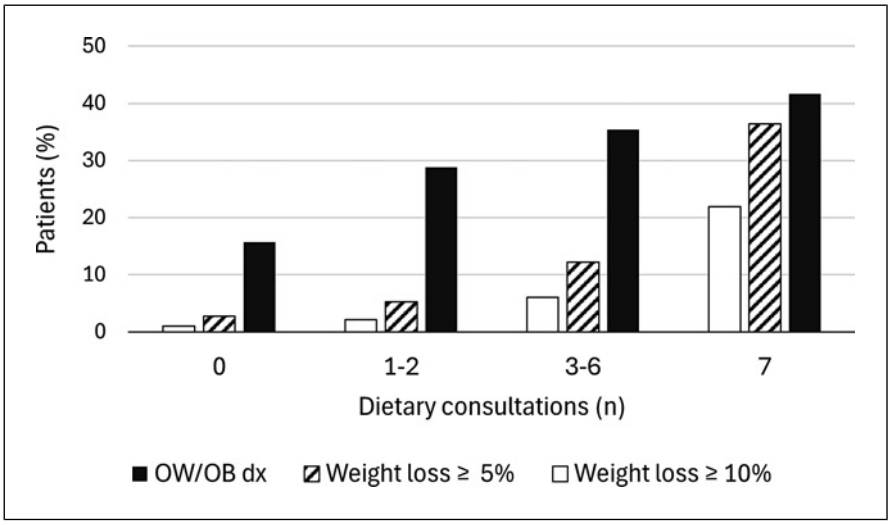

Fig. 2. Attendance at dietary consultations and its relation to recorded diagnosis of OW/OB and weight loss. Patient percentage was calculated from the total number of patients in the indicated category of attendance. Trend was statistically significant for all variables, $p < 0.001$.

significant to moderate motivation [17]. Aside from a recorded diagnosis of OW/OB and attendance at a dietary consultation, we presented additional independent predictors of clinically significant weight loss: BMI at baseline, female sex, and young age, which were also reported in by others [12, 18].

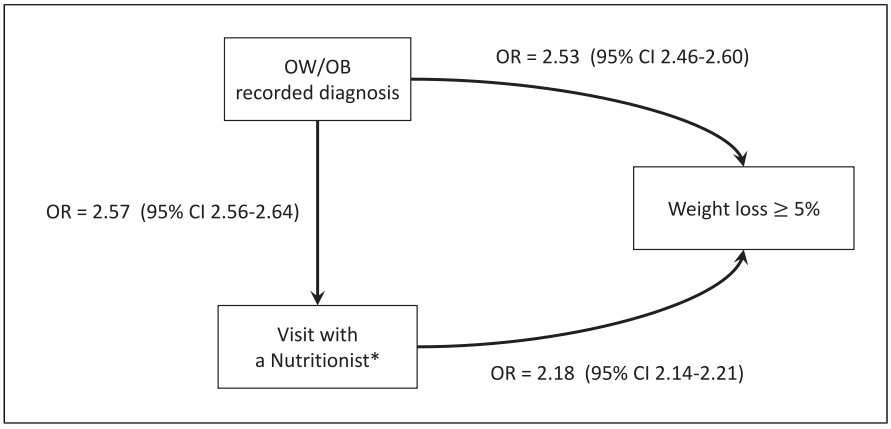

Fig. 3. Relationship between recorded diagnosis of OW/OB and attendance at dietary visit or weight loss of ≥5% (univariate logistic regression). All associations are statistically significant, $p < 0.001$. *At least one visit with a nutritionist within 9 months after body weight measurement at the index event. OW/OB, overweight or obesity; OR, unadjusted odds ratio.

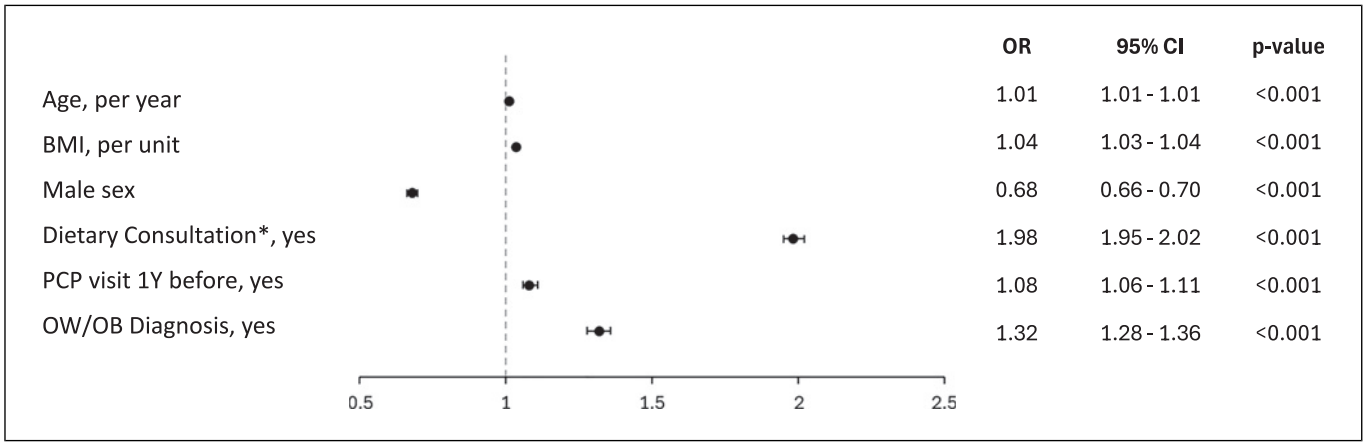

Fig. 4. Forest plot based on the results of multivariate logistic regression model adjusted for diagnosis of OW/OB and additional factors associated with achieving weight loss. The outcome variable was defined as positive if the patient achieved weight loss of 5% or more of their initial body weight. The second body weight measurement was taken 9–15 months after the index visit. *Attendance of at least one visit with a dietitian within 9 months after the index visit. OW/OB, overweight or obesity; PCP, primary care provider; OR, adjusted odds ratio.

To the best of our knowledge, this is the first study to demonstrate that recording OW/OB diagnosis may increase patient attendance at dietary consultations. Our previous study demonstrated an association between a recorded diagnosis and offering obesity care by the PCP, including issuing a referral for dietary consultation [10]. In general, the rate of patient referral to dietary consultation among people with chronic medical conditions, including obesity, is low [19]. Others have reported low rates of attendance at in-person dietary consultations, despite receiving a referral from a PCP [20]. In our study, less than 14.0% of people with OW/OB visited a dietitian following increased BMI measurement in the clinic, even though dietary consultations are easily accessible and reimbursed by the Israeli public healthcare system. In a randomized controlled study conducted in the UK, even very brief structured advice from a PCP was associated with increased attendance at a community delivered weight loss program and higher likelihood of achieving weight loss compared to receiving general advice about the health benefits of weight loss [21]. Female sex was associated with higher attendance at dietary consultations, in agreement with other reports [20, 22]. In contrast to the former, in the current study, young age was associated with higher attendance. The differences in the reports regarding the association between age and patient attendance might be related to the fact that our cohort included relatively young and healthy people, without prior obesity-related comorbidities. Therefore, our patients with high attendance may have had different motivations to lose weight. Young patients may be strongly motivated to lose weight for aesthetic reasons

rather than for improved health outcomes [23]. Another possible explanation is that here we reported patients' attendance at in-person visits with a nutritionist, whereas other reports focused on attendance in a structured weight loss program. Differences in healthcare coverage of dietary consultations may also explain differences in reported attendance rates.

The present study demonstrated that an in-person dietary consultation with a registered dietitian in the primary care setting is a strong independent predictor of clinically significant weight loss. Multiple studies have demonstrated that attendance at weight loss programs is associated with weight loss. Most studies described patient attendance in a structured program of intensive lifestyle modifications offered either in the community [24–27] or in specialty clinics, where most patients also received anti-obesity medications [28]. For example, in the Canberra public multidisciplinary program for weight loss for patients with obesity class III with related comorbidities, 36% achieved ≥5% weight loss, and higher patient attendance was associated with improved weight loss [25]. A meta-analysis by Williams et al. [29] investigated the effectiveness of individualized nutrition care for weight management, concluded that patients who were counselled by a dietitian lost an additional 1.03 kg of weight, a relatively modest effect, compared to those receiving usual care. To the best of our knowledge, the present study is the first to demonstrate the effect of unstructured, individual dietary consultations in the primary care setting, on robust weight loss at 1 year of follow-up.

The current study had several limitations. The multivariate model did not include data on other weight loss interventions, such as purchases of anti-obesity medications, bariatric surgery, or lifestyle modification such as physical activity, prior to the second body measurement, which might have weakened the association between OW/OB diagnosis and weight loss. In a previous publication [10], we reported a very low rate anti-obesity drug prescription, with only 0.5% of the people in this cohort were issued a prescription, suggesting an even lower rate of prescription filling, especially since these drugs are not covered by the national health insurance. In addition, prescription rate of anti-obesity medication did not differ between patients who achieved weight loss and those who did not. Therefore, it is likely that the association between OW/OB diagnosis and weight loss was not mediated by use of anti-obesity medications. In addition, a second body weight measurement at 9–15 months after the index event was missing for about 80% of the initial cohort. Those who did not have a second measurement had a lower rate of OW/OB diagnosis recording at the index visit, and a lower attendance rate at a consultation with a dietitian, which could weaken the results. Lastly, the study was performed in the primary care setting in Israel and may not be generalizable to other healthcare systems around the world.

Conclusions

This study presents a strong association between a PCP recording a diagnosis of OW/OB and the patient achieving a clinically significant weight loss, in relatively healthy young population with increased BMI and low utilization of anti-obesity medications. The association was only partially mediated by attendance at dietary consultations, suggesting that the PCP diagnosis may empower and motivate patients with OW/OB to implement lifestyle modifications on their own. The association between a recorded diagnosis of OW/OB and the incidence of obesity-related complications warrants further investigation and will be the focus of future studies. Taken together, the high rates of undiagnosed OW/OB present a significant opportunity to promote weight loss and potentially affect weight trajectory and population health.

Statement of Ethics

The Maccabi Healthcare Services Ethics Review Committee approved the study protocol, data collection and analysis, Approval No. 0036-21-MHS. The committee has granted this study an exemption from requiring written informed consent.

Conflict of Interest Statement

M.K.M reports receipt of speaker fees from Novo Nordisk LTD, Eli Lilly, Sanofi and Boehringer Ingelheim. D.O. reports receipt of speaker fees from Novo Nordisk LTD, Eli Lilly, Pfizer, CTS Ltd., and Boehringer Ingelheim. N.K.M. reports no CI.

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Author Contributions

M.K.M contributed to the study conceptualization and design, data curation, analysis and interpretation, and manuscript drafting. N.K.M. contributed to the study design methodology, statistical analysis, drafting the manuscript figures and tables, and

reviewed the manuscript. D.O. contributed to the study conceptualization and design, and reviewed and edited the manuscript. All authors approved the final version of the manuscript, and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Data Availability Statement

In accordance with the Israeli Ministry of Health regulations, individual-level data cannot be shared openly. Specific requests for remote access to de-identified community-level data should be directed to KSM, Maccabi Healthcare Services Research and Innovation Center.

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