A study of the relation between body mass index and the incidence of age related macular degeneration

H A Moeini, H Masoudpour, H Ghanbari

Background: Age related macular degeneration (ARMD) is the most frequent cause of blindness among the elderly. Obesity may be one of the risk factors of ARMD as suggested, yet not proved, by several studies. This study assesses the relation between body mass index (BMI) and the incidence of ARMD.

Methods: This case-control study included 50 patients with ARMD and 80 subjects who were adjusted for age, sex, cigarette smoking, blood pressure, and diabetes. Data analysis was performed by SPSS V9.0 using Student’s t and $\chi^2$ tests.

Results: 42% of the subjects in the case group and 35% of those in the control group were men. Mean age of subjects in the case and control groups was 69.9 years (62–77 years) and 64.08 years (56–71 years), respectively. Mean BMI measured 25.38 (range 21–29) and 30.24 (26–34) in the case and control groups, respectively (p > 0.05). 12% of subjects in the case group were obese, 42% were overweight, and 14% were lean. 22.5% of subjects in the control group were obese, 45% were overweight, and 7.5% were lean (p > 0.05).

Conclusion: 43% of patients in this study were aged 70 years or older, which is similar to other studies. There was no significant difference in BMI between the case and control groups. Recent studies indicate that obesity is a probable risk factor for progression of ARMD, but there is no significant relation with the presence of ARMD. With multifactorial analysis, the authors could identify no significant relation between the presence of ARMD and the studied risk factors.

Age related macular degeneration (ARMD) is a degenerative disease of the macula and the leading cause of blindness and visual impairment among people aged 50 years or over in the United States and other developed countries throughout the world.1–20 ARMD affects about 2% of Americans aged 52–64 years, and 28% aged 75 years and older.2 Successful treatment is limited to an unacceptably small percentage of patients.1 In the past two decades most studies have therefore concentrated on the identification of risk factors associated with the development and/or progression of ARMD. These studies investigate the effects of environmental, genetic, and cardiovascular risk factors on ARMD.21 Given that ARMD induced visual impairment is essentially an old age affliction, most investigators prefer to find modifiable factors, so that patients can be advised on how to prevent the development of ARMD. As probability of a causal relation, these studies imply that smoking cessation and interventions to control blood pressure, atherosclerosis, glucose, dyslipidaemia, and body weight could help lessen the incidence and/or progression of ARMD.21 Less consistently, it has been proposed that the use of antioxidants (vitamins C and E) may have some protective role against ARMD.21–23 Obesity is a common and serious medical problem throughout the world, which has adverse effects on health and longevity.23–25 Several studies have suggested obesity as a risk factor conducive to ARMD progression; nevertheless, no significant difference has been found regarding the effect of obesity on ARMD.26 As most ARMD environmental risk factors are preventable, and in view of the undesirable effects of ARMD on the patients’ working ability and mental health, identification and modification of other environmental risk factors may be effective in decreasing the incidence and controlling the progression of ARMD.

Body mass index (BMI) as a risk factor for ARMD has been the focus of few studies; hence we examined the association between BMI as a modifiable risk factor and development of ARMD.

PATIENTS AND METHODS
This case-control study was conducted on patients presenting to Feiz Ophthalmology Center in Isfahan, Iran (September–March 2001). Based on findings of similar studies, sample size was calculated at 50 subjects in the case group, and 80 in the control group. Patients diagnosed with ARMD by an ophthalmologist cooperating with the study were included. Two ophthalmologists confirmed the diagnosis of ARMD using stereoscopic slit lamp and biomicroscopic examination with a special contact lens. Control subjects were also examined to rule out retinal changes. The type of ARMD was determined and entered in data collection forms. The subjects’ weight and height were measured by a single technician using a mounted Secca scale and a calibrated metre tape. The case and control subjects’ blood pressure was also measured and recorded according to the standard protocol. History of smoking (packs/year), antihypertensive and/or antidiabetic medication, and duration of hypertension and/or diabetes were taken and recorded in data collection forms. Control subjects were selected among normal individuals and were matched for age, sex, and risk factors. Control group data were also obtained using data collection forms. Data analysis was conducted with SPSS V9.0 using Student’s t, $\chi^2$, logistic regression, and correlation tests.

RESULTS
A total of 42% of subjects in the case group were male and 58% were female. Table 1 represents a comparison of demographic characteristics and ARMD risk factors between the two groups. In this study, there was no significant difference between the two group regarding history of smoking and duration of hypertension and/or diabetes.

Mean (SD) of BMI in the case and control groups measured 25.38 (3.85) and 30.24 (28.55), respectively.

Abbreviations: ARMD, age related macular degeneration; BMI, body mass index.
individuals also seemed to be at risk. Mean (SD) of BMI in obesity was considered a risk factor for ARMD, yet lean overweight, and obese individuals, respectively. In this study, ARMD development measured 1.43, 1.24, and 2.15 for lean, BMI and development of ARMD; however, risk ratio for neovascular ARMD showed a significant association between study by Schaumberg control subjects were overweight and 22.5% were obese. A study were overweight and 12% were obese. Similarly, 45% of countries. As gauged by BMI, 42% of the cases in this visual impairment in people 50 years or over in developed TABLE 2 Comparison of body mass index (BMI) in case and control groups

<table>
<thead>
<tr>
<th>Case (n = 50)</th>
<th>Control (n = 80)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lean BMI &lt;20</td>
<td>7 (14)</td>
<td>6 (7.5)</td>
</tr>
<tr>
<td>Normal 20 ≤ BMI &lt;25</td>
<td>16 (32)</td>
<td>20 (25)</td>
</tr>
<tr>
<td>Overweight 25 ≤ BMI &lt;30</td>
<td>21 (42)</td>
<td>36 (45)</td>
</tr>
<tr>
<td>Obese BMI ≥30</td>
<td>6 (12)</td>
<td>18 (22.5)</td>
</tr>
</tbody>
</table>

NS, not significant.

FIGURE 1 Comparison of body mass index (BMI) in case and control groups

Table 2 shows a comparison of BMI in case and control subjects. Mean (SD) of height, weight, and BMI measured 157.67 (8.76) cm, 63.20 (11.7) kg, and 25.38 (3.58), respectively, in the case group, and 154.61 (12.07) cm, 67.03 (17.29) kg, and 30.24 (28.55), respectively, in the control group (p<0.05). In this study, mean (SD) of right intraocular pressure measured 15.24 (3.71) mm Hg (10 mm Hg–28 mm Hg) in the case group and 17.14 (3.33) mm Hg in the control group (p<0.05). Table 2 shows a comparison of BMI in case and control groups measured 15.72 (3.64) mm Hg and 17.95 (6.36) mm Hg, respectively, showing a significant difference between the two groups.

Recent studies of patients with open angle acute glaucoma have highlighted BMI as an independent and significant risk factor for increased intraocular blood pressure. Studies of the association of BMI and intraocular pressure have yielded results consistent with these findings.

These findings did not implicate BMI in the development of ARMD. Mean (SD) of age in the case group was 69.9 (7.32) years. In similar studies, ARMD patients had a mean age of 66 years, within a range of 43–99 years. In this study, BMI in the control group was higher than that in the case group. Other risk factors may have a more prominent role in the development of ARMD. There are inconsistent results regarding the protective effect of antioxidants on the incidence of ARMD. Some studies have proposed that factors such as age, tobacco smoking, heredity, sex, high blood pressure and other cardiovascular risk factors, iris colour, age menopause, hormone replacement therapy, diet, and oxidative damage may be effective in the development and progression of ARMD.

Nevertheless, opinions are divided and further multicentric studies are warranted to better understand the role of each of these factors.

ARMD is known to be of multifactorial aetiology and obesity does not seem to be directly involved in its pathophysiology, however, since obesity has been related to many of the complications associated with old age, preventing it may lessen the effect of other ARMD risk factors.

DISCUSSION

Age related macular degeneration is the leading cause of visual impairment in people 50 years or over in developed countries. As gauged by BMI, 42% of the cases in this study were overweight and 12% were obese. Similarly, 45% of control subjects were overweight and 22.5% were obese. A study by Schaumberg et al of 256 cases of dry and 84 cases of neovascular ARMD showed a significant association between BMI and development of ARMD; however, risk ratio for ARMD development measured 1.43, 1.24, and 2.15 for lean, overweight, and obese individuals, respectively. In this study, obesity was considered a risk factor for ARMD, yet lean individuals also seemed to be at risk. Mean (SD) of BMI in the case and control groups in this study measured 25.38 (3.85) and 30.24 (2.85), respectively, showing no significant difference between the two groups.

Given the multifactorial aetiology of ARMD, the main physiopathology of ARMD was seen less often in patients with lower BMI, although comparison of BMI did not show a significant difference between case and control groups. ARMD patients had more risk factors. Although no significant difference was observed, the difference can thus be explained.

Mean (SD) of right intraocular pressure in the case and control groups measured 15.24 (3.71) mm Hg and 17.14 (3.33) mm Hg, respectively. Left intraocular pressure in the case and control groups measured 15.72 (3.64) mm Hg and 17.95 (6.36) mm Hg, respectively, showing a significant difference between the two groups.

TABLE 1 Comparison of demographic factors and ARMD risk factors in the case and control groups

<table>
<thead>
<tr>
<th>Sex</th>
<th>Case (n = 50)</th>
<th>Control (n = 80)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>21 (42%)</td>
<td>28 (35%)</td>
<td>NS</td>
</tr>
<tr>
<td>Female</td>
<td>29 (58%)</td>
<td>52 (65%)</td>
<td>NS</td>
</tr>
<tr>
<td>Mean age (SD)</td>
<td>69.9 (7.32)</td>
<td>64.08 (7.6)</td>
<td>NS</td>
</tr>
<tr>
<td>Diabetes</td>
<td>10 (20%)</td>
<td>13 (16.25%)</td>
<td>NS</td>
</tr>
<tr>
<td>Hypertension</td>
<td>23 (46%)</td>
<td>34 (42.5%)</td>
<td>NS</td>
</tr>
<tr>
<td>Smoking</td>
<td>10 (20%)</td>
<td>12 (15%)</td>
<td>NS</td>
</tr>
<tr>
<td>Mean blood pressure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systole (mm Hg) (SD)</td>
<td>143.3 (31.8)</td>
<td>150.5 (26.4)</td>
<td>NS</td>
</tr>
<tr>
<td>Diastole (mm Hg) (SD)</td>
<td>83.2 (15.1)</td>
<td>84.03 (14.1)</td>
<td>NS</td>
</tr>
</tbody>
</table>

NS, not significant.
REFERENCES


