PREVALENCE OF HYPERTENSION AND OBESITY IN CIVIL AVIATION PILOTS IN INDIA AND THEIR CORRELATION: IS IT TIME TO CHANGE FITNESS CERTIFICATION GUIDELINES?

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Disclosure Information

Gp Capt Dr G Keshavamurthy

• This presentation is made for Non Profit Research and is solely for educational purpose only

• The Article has been published recently in ‘Aerospace Medicine and Human Performance’ Journal Vol.90, No.8 August 2019 (Pg 703-708). Details of the article can be obtained from AsMA’s website
Background

• Hypertension (HT) – Common Cardiovascular disease
• Prevalence 20-25% in general population
• Currently JNC VIII Criteria for blood pressure used in fitness evaluation and certification (BP cut off 140/90)
• New ACC/AHA Criteria of 2017 (BP cut off 130/80) – not used
• Prevalence as per new criteria not known
• Prevalence of overweight and obesity in pilots is also not studied
Material & Methods

- Cross Sectional Observational Study
- Civil Aviation Pilots – 1185 consecutive pilots
- Routine Medical examination
- Informed Consent, Privacy
- Ethical clearance, Permission from DGCA, India
- Height, Weight measurement
- BMI = Wt (Kg)/(Height in meter$^2$)
- Blood Pressure recording as per Standard method
- 24 h ABPM, where indicated
Methods

• Data captured in a systematic format
• Diagnosis of HT – as per standard JNC VIII criteria (140/90)
• Established cases of HT also included
• New Criteria for HT (Cut off 130/80) used to study the prevalence; not for disposal
• Overweight and obesity were studied as per WHO Criteria for advice and disposal
• Asia Pacific criteria used to assess only prevalence of Overweight/Obesity as per this criteria
### JNC VIII

**Table 3. Classification of Blood Pressure in Adults (age ≥18 years)**

<table>
<thead>
<tr>
<th>Classification</th>
<th>Systolic Blood Pressure (mmHg)</th>
<th>Diastolic Blood Pressure (mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;120</td>
<td>AND &lt;80</td>
</tr>
<tr>
<td>Prehypertension</td>
<td>120-139</td>
<td>OR 80-89</td>
</tr>
<tr>
<td>Stage 1 HTN</td>
<td>140-159</td>
<td>OR 90-99</td>
</tr>
<tr>
<td>Stage 2 HTN</td>
<td>≥160</td>
<td>OR ≥100</td>
</tr>
</tbody>
</table>

### ACC/AHA 2017 Classification of BP

<table>
<thead>
<tr>
<th>Category</th>
<th>BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;120/80 mm Hg</td>
</tr>
<tr>
<td>Elevated</td>
<td>120-129/&lt;80 mm Hg</td>
</tr>
<tr>
<td>Stage 1 hypertension</td>
<td>130-139/80-89 mm Hg</td>
</tr>
<tr>
<td>Stage 2 hypertension</td>
<td>≥140/90 mm Hg</td>
</tr>
</tbody>
</table>

BP = blood pressure.
* Based on accurate measurements and average of ≥2 readings on ≥2 occasions.
## New ACC/AHA Hypertension Guidelines

**Make 130 the New 140**

<table>
<thead>
<tr>
<th>Systolic, Diastolic Blood Pressure (mm Hg)</th>
<th>JNC VIII</th>
<th>2017 ACC/AHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;120 and &lt;80</td>
<td>Normal BP</td>
<td>Normal BP</td>
</tr>
<tr>
<td>120–129 and &lt;80</td>
<td>Prehypertension</td>
<td>Elevated BP</td>
</tr>
<tr>
<td>130–139 or 80–89</td>
<td>Prehypertension</td>
<td>Stage 1 hypertension</td>
</tr>
<tr>
<td>140–159 or 90–99</td>
<td>Stage 1 hypertension</td>
<td>Stage 2 hypertension</td>
</tr>
<tr>
<td>≥ 160 or ≥100</td>
<td>Stage 2 hypertension</td>
<td>Stage 2 hypertension</td>
</tr>
</tbody>
</table>
Criteria for Diagonising Hypertension using 24 Hrs Ambulatory BP Monitoring

<table>
<thead>
<tr>
<th>Ambulatory BP Monitoring (ABPM)</th>
<th>Systolic BP in mmHg</th>
<th>Diastolic BP in mmHg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day time average (Awake)</td>
<td>≥135</td>
<td>≥85</td>
</tr>
<tr>
<td>Night time average (Sleep)</td>
<td>≥120</td>
<td>≥70</td>
</tr>
<tr>
<td>24 or 48 hour average</td>
<td>≥130</td>
<td>≥80</td>
</tr>
</tbody>
</table>
Results

- 1185 Pilots studied
- Mean age 34.8±13.7 years (Range 18-65)
- Males 91.4%, Females 9.6%
- Prevalence increased above age 30 years
- Maximum noted in 26-35 years age group
Results

- Normotensives 89.1%
- 10.9% had BP $\geq 140/90$ mmHg
- 24 h ABPM done in 10.9%
- 4.1% HT
- 6.8% – White Coat HT (WCH)
- WCH > HT
Results

- HT as per new ACC/AHA Criteria
- Total 18.7% HT
- Prevalence more in age ≤ 35 yr
- Paradoxical Association
- Cause? Explanation?
Normotensives and Hypertensives as per new ACC/AHA Criteria of 2017

- Normotensive: 222, 19%
- Elevated: 162, 14%
- Hypertensive: 801, 67%
## Body Mass Index (BMI) Classification

<table>
<thead>
<tr>
<th>CLASSIFICATION</th>
<th>WHO CRITERIA</th>
<th>ASIA PACIFIC CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BMI (kg/m²)</td>
<td>BMI (kg/m²)</td>
</tr>
<tr>
<td>Underweight</td>
<td>&lt;18.5</td>
<td>&lt;18.5</td>
</tr>
<tr>
<td>Normal</td>
<td>18.5 – 24.9</td>
<td>18.5 – 22.9</td>
</tr>
<tr>
<td>Overweight</td>
<td>≥23</td>
<td>24.9</td>
</tr>
<tr>
<td>Obese</td>
<td>≥30</td>
<td>≥25</td>
</tr>
</tbody>
</table>
Results – Overweight/Obesity

As per WHO Criteria
Normal BMI 53.7 %
Overweight 39 %
Obesity 7.3%

As per Asia Pacific Criteria
Normal 30.4%
Overweight 23.3 %
Obesity 46.3 %
Obesity & HT Correlation

- BMI > 25 $\Rightarrow$ 2.65 times higher risk of having HT (OR 2.65, 95% CI 0.9 – 7.77)

- BMI > 23 $\Rightarrow$ 6.86 times higher risk of having HT (OR 6.86, 95% CI 0.9-52.58)
Scatter diagram showing rise in Systolic BP (SBP) as BMI increases above 23

\[ y = 0.8484x + 108.43 \]

\[ R^2 = 0.0536 \]
Scatter diagram showing rise in Diastolic BP (DBP) as BMI increases above 23
Discussion

• Prevalence of HT in our civil aviation pilots 4.1%
• Less versus general population; but consistent with Chinese study in pilots where it was 4.96%
• If new criteria applied, prevalence would be 18.7%; No similar studies in civil pilots could be found on internet search
• Additional 6.2% require medication (10 yr ASCVD risk > 10%)
• Which guideline to adopt?
• Flight safety vs Loss of trained and skilled manpower
• New Criteria if adopted will affect operational readiness
Discussion

• Prevalence of Overweight 39%, Obesity 7.3%; high compared to general population
• If Asia Pacific criteria used, Obesity 46.3%, Overweight 23.3%
• Risk of HT increased as BMI > 23; OR 6.86
• Therapeutic life style measures should be instituted in pilots if BMI > 23 kg /sq. m
• 10 yr ASCVD risk calculation if BP > 130/80 and drug therapy to be instituted in the interest of flight safety
Need: Change in Practice

- BMI Cut off for South Asian pilots should be 23 kg/sq.m
- BP Cut off to be 130/80 mmHg for initiation of life style measures
- 10 yr ASCVD risk calculation to be included
- ICAO Guidelines need to be changed/Larger studies
- Additional (6.2%) percentage of pilots who require medication may affect immediate operational readiness but in the long term will improve flight safety
Thank You