Predicting Alzheimer's Disease Onset

Harold I. Zeliger

Abstract—Recently, a method for assigning the probability of disease onset to all people, those clinically ill as well as those without prevalent disease has been described and termed the Oxidative Stress Index (OSI). The OSI, as originally formatted, does not predict which disease will more likely develop, only that further disease is predicted with increased OSI. It is hypothesized here that the OSI may be used to demonstrate which parameters are more contributory to the onset of a particular disease if it is measured at the time of onset of that disease. To test this hypothesis, the OSI has been reformatted to serve in that capacity for Alzheimer’s disease (AD) with the anticipation that the OSI could serve to predict not only the likelihood of onset, but also identify those parameters that are most contributory to AD.

Index Terms—Alzheimer’s Disease; Oxidative Stress; Oxidative Stress Index; Predicting Disease Onset.

I. INTRODUCTION

People with chronic diseases and those who are disease free but living unhealthy lifestyles are known to be candidates for numerous non-communicative diseases, as well as more frequent and more severe bouts with infectious diseases. Recently, a method for assigning the probability of disease onset to all people, those clinically ill as well as those without prevalent disease has been described and termed the Oxidative Stress Index (OSI). This method is a non-invasive diagnostic protocol based upon a questionnaire addressing oxidative stress (OS) elevating factors that include disease status, lifestyle and environmental exposure with the sum of the positive answers equal to the OSI [Zeliger, 2017].

The OSI, as originally formatted, does not predict which disease will more likely develop, only that further disease is predicted with increased OSI. It is hypothesized here that the OSI may be used to demonstrate which parameters are more contributory to the onset of a particular disease if it is measured at the time of onset of that disease. To test this hypothesis, the OSI has been reformatted to serve in that capacity for Alzheimer’s disease (AD) with the anticipation that the OSI could serve to predict not only the likelihood of onset, but also identify those parameters that are most contributory to AD.

II. METHODS

The hypothesis proposed here is based upon a literature review of published studies on the causes of OS, parameters associated with the onset of AD, OS induced disease, methods of measuring OS and the empirical and mechanistic associations between AD and OS.

III. RESULTS

A. Oxidative Stress

It is well known that all disease is accompanied by elevated OS, a property whose status can be measures by a number of biomarkers, including F2-Isoprostanes, lipid hydroxides and hydroperoxides, hydroxycholesterols, aldehydes and ketones [Zeliger, 2016]. Of these, the most widely used is malondialdehyde (MDA), which is stable in serum, as well as readily and accurately analyzed for [Nielsen, et al, 1997]. MDA level, however, can vary widely depending upon food eaten, environmental exposures, state of one’s health or even the time of day when serum is drawn [Nielsen, et al, 1997]. The OSI questionnaire reduces such uncertainty by addressing nineteen different aspects of a person’s regular life, including disease status, medications, diet, employment, environmental exposures, and stress, etc., that elevate OS.

Oxidative stress has been shown to be a crucial mechanistic component of AD onset [Liu, et al., 2015; Huang, et al., 2015; Kamat, et al., 2016; Tonnies and Trushina, 2017] and has been definitively associated with brain neuroinflammation and blood-brain barrier dysfunction that is both a cause and consequence of AD generating hyperpermeability that leads to the absorption of as well as generation of OS inducing species in the brain [Zhang & Jiang, 2015; Erickson & Banks, 2013; Najjar, et al., 2013].

It is also known that disease onset likelihood is related to total oxidative stress arising from numerous sources [Zeliger 2016 and the references contained therein]. These are listed in Appendix (Table I).

B. Dose Response Relationship

Total Oxidative Stress has been shown to be related to disease onset, whether coming from single sources or from a combination of other sources in a dose response relationship (DRR) [Zeliger, 2016]. A single source example of this effect as it applies to AD is exposure to radon [Lehrer, et al., 2017]. Multiple source examples are lifetime cigarette smoking [Mons, et al., 2013; Durazzo, et al., 2014] and simultaneous exposure to heavy metals and polynuclear aromatic hydrocarbons [Deng, et al., 2019]. DRRs for increased OS include exposures to trichloroethylene, perchloroethylene, air pollution, tobacco smoking, metals (including arsenic, cadmium and mercury), polynuclear aromatic hydrocarbons [Kuang, et al., 2013; Zeliger, 2016] and ultra violet radiation [Agarwal, et al, 1987].
C. Parameters Known to Increase Likelihood of AD Onset

AD is characterized by deposition of amyloid-beta plaques, hyperphosphorylated tau protein and neurofibrillary tangles [Kamat et al., 2016]. It is well known that elevated oxidative stress is associated with increased likelihood of AD onset [Christen, 2000; Perry et al., 2002; Huang et al., 2016, Durazzo et al., 2014, Durazzo et al., 2014a]. The individual parameters and their references are listed in Appendix (Table II). Oxidative stress has also been shown to be a crucial mechanistic component of AD onset [Liu et al., 2015; Huang et al., 2015; Kamat et al., 2016; Tonnis and Trushina, 2017].

Several parameters have been shown to increase the likelihood of AD onset. These and representative references for them are shown in Appendix (Table II).

D. Aging

Aging is not a disease. Rather, it is a natural consequence of living, but is accelerated by OS. It is widely theorized that excessive OS contained within mitochondria damage the mitochondria which in turn leads to increases in OS. Once started, this cycle leads to further increased OS and aging, making OS both the cause and the result of disruption of homeostasis which leads to aging and onset of Alzheimer's disease as well as type 2 diabetes, cardiovascular diseases and COPD [Dato et al., 2013; Cencioni et al., 2013; Guillaumet-Adkins et al., 2017]. As we age, free radicals are excessively generated and overwhelm the body's natural antioxidant response, leading to increased OS [Dato et al., 2013]. Actions that can be taken to slow down the aging process are discussed in the prevention section below.

E. Genetics and Epigenetics

Genetics and epigenetics have been shown to contribute to the onset of AD. It is well known that AD runs in families and that inheriting one copy of the APOE4 gene triples the risk of developing AD, while inheriting 2 copies of APOE4 increases the risk by 10 to 15 times [Jiang et al., 2013; Dato et al., 2013; Guillaumet-Adkins et al., 2017; Cencioni et al., 2013].

Epigenetic changes are heritable changes in gene expression that are not the result of alterations in the DNA sequence. These changes do, however, elevate OS and have been linked to the onset of cardiovascular diseases, respiratory system diseases and neurological system diseases, including AD [Cencioni et al., 2013; Jiang et al., 2013; Guillaumet-Adkins et al., 2017]. The presence of AD in blood relatives has been shown to be associated with greater incidence of the disease. The likelihood of an individual falling ill with AD increases with increasing AD prevalence in parents, grandparents and siblings [National Institute of Aging, 2015].

F. Co-Morbidities

AD is co-morbid with numerous other diseases. These include hypertension, cardiovascular diseases, type 2 diabetes, ocular disorders, sleep disorders, cognitive and behavioral deficits, bladder and bowel control problems, obesity and musculoskeletal diseases [Barbagallo & Dominguez, 2014; Bannon, 2002; Duthie et al., 2011; Bunn et al., 2014; Bauer et al., 2014; Poblador-Plou et al., 2014; Fafara et al., 2014; Zeliger, 2014; Alford et al., 2018; Naderali et al., 2009; Karki et al., 2017].

Though mechanistic explanations have been offered for some of the co-morbid pairs, AD and T2D or obesity, for example [Profenno et al., 2009; Barbargallo & Dominguez, 2014; Karki et al., 2017], other AD co-morbidities are yet to be mechanistically tied together. However, all of the diseases that are co-morbid with AD are, like AD, known to be caused be elevated OS [Zeliger, 2016].

G. Late Onset of AD

OS caused diseases manifest themselves only after long term (years) exposure to causative agents. Examples of such diseases are cardiovascular diseases, type 2 diabetes, COPD, cancers and AD. In the case of AD, even early onset of disease, before age 65, follows many years of exposure to OS causing stimuli and in the case of persistent organic pollutants, storage in the body's adipose tissue for up to decades[Cencioni et al., 2013; Zeliger 2013; Zeliger & Lipinski 2015].

H. Prevention

Further evidence for the relationship of AD with OS comes from a consideration of lifestyle changes known to lower AD incidence. It is estimated that as many as one half of the cases of AD are attributable to the following eight modifiable factors [Barnes and Yaffe, 2011]. These include:

- Acting to prevent and manage type 2 diabetes
  - Acting to prevent or treat hypertension
  - Not smoking
  - Maintaining physical activity
  - Maintaining cognitive activity
  - Treating depression, if present
  - Prevent or reverse obesity
  - Maintaining a diet that is low caloric, high in fruits and vegetables, whole grains, and nutritional antioxidants with reduced quantities of carbohydrates, saturated fats, red and processed meats. There are several versions of such a diet. The Mediterranean diet includes the consumption of large quantities of extra virgin olive oil and moderate quantities of red wine [Dato et al., 2013]. Other examples include the Okinawan diet, (followed by residents of Okinawa, Japan), the Dash diet (developed to stop hypertension) and the Portfolio diet (aimed at reducing cholesterol levels ) [Wilcox et al., 2014].

- It has also been reported that AD prevalence can be significantly reduced by properly treating the following conditions, which undermine immune system vitality and lead to chronic inflammation, which is known to elevate OS [Trempe & Lewis, 2018, Zeliger, 2017].
  - Chronic migraines
  - Mood disorders
  - Eye diseases
  - Metabolic syndromes
  - Chronic viral diseases
  - Hormonal diseases
  - Autoimmune diseases

All of the AD causative factors discussed above raise OS.
while the preventative factors all lower OS. It is, therefore, reasonably hypothesized that avoiding other OS elevating factors such as chronic infections which stresses the immune system and result in chronic inflammation, as well as chronic environmental exposures to toxic chemicals and radiation, which also elevated OS can delay onset of AD by years. And that is what the OSI does.

I. Questionnaires

Questionnaires, such as the Charlson Comorbidity Index, are routinely used to solicit patient background information on prevalent diseases, symptoms and likelihood of further disease onset [Charlson et al., 1987]. The Alzheimer's Questionnaire is another example [Sabbagh, et al., 2010].

IV. DISCUSSION

As all of the AD causative factors raise OS, and all the preventative AD factors lower OS, it is, therefore, reasonably hypothesized that avoiding other OS elevating factors such as chronic infections which stresses the immune system and result in chronic inflammation, as well as chronic environmental exposures to toxic chemicals and radiation, which also elevate OS, can delay onset of AD by years.

From the results described above, it is clear that there is no single cause of AD, but that AD onset can be triggered by numerous parameters, all of which are associated with elevating OS.

It is hypothesized here that increased levels of OS is ultimately responsible for increased incidence of AD, that all parameters which contribute to OS elevation increase the likelihood of AD onset and that total OS, measured via the OSI questionnaire administered to the patient or surrogate at the time of first diagnosis of AD can shed light on, not only the patient's total OS, but also, via analysis of statistically significant patient results, on those parameters which are primary contributors to AD onset.

Accordingly, all factors known to raise OS have been incorporated into the modified OSI questionnaire shown in Appendix (Table III). This version of the OSI contains genetic and epigenetic items known to correlate to increased incidence of AD. These are.

As discussed above, exposures to numerous environmental agents have been associated with increased prevalence of AD. These have also been incorporated into the questionnaire.

A. Strengths

The OSI is non-invasive, yet predicts OS levels and offers insights into which parameters are the most contributory to AD onset. Individual items in the OSI are presented in alphabetical order and may differ widely from one item to the next. This is deliberate so that the patient or surrogate addressing the OSI is required to consider each item alone, rather than a part of a series of related questions, which could cause the responder to just check all the items in a single set.

B. Limitations

All parameters in the OSI carry equal weight. Clearly, some parameters are more detrimental to health to others, Parkinson's disease versus the chronic sinusitis, for example. That said, more serious diseases will generally produce greater number of symptoms and require more medications than less severe ones. The large number of items in the OSI, also reduce to importance of any one item to the overall score obtained.

V. CONCLUSIONS

The hypothesis presented here is that AD is an oxidative stress induced disease, as all established causes of AD have been shown to raise OS. Accordingly, anything that raises OS is potentially a contributing cause to AD. Conversely, anything that lowers OS, or prevents raising it, potentially delays or prevents AD onset. It is anticipated that statistical analysis of data collected will shed light on those parameters that most contributory to the onset of AD.

The Oxidative Stress Index measured at time of AD onset is potentially a valuable tool that can lead to an understanding of what the primary causative agents of AD are.

APPENDIX

TABLE I: SOURCES KNOWN TO INCREASE OXIDATIVE STRESS [ZELIGER 2016].

<table>
<thead>
<tr>
<th>Parameter</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toxic Chemical Exposures</td>
<td>Block &amp; Calderon-Garcidueñas, 2009;</td>
</tr>
<tr>
<td>Radiation Exposure</td>
<td>Moulton &amp; Yang, 2012; Carey, et al., 2018;</td>
</tr>
<tr>
<td>Tobacco Smoke</td>
<td>Kilhan &amp; Kitazawa, 2018</td>
</tr>
<tr>
<td>Alcohol &amp; Recreational Drugs</td>
<td></td>
</tr>
<tr>
<td>Pharmaceutical Drugs</td>
<td></td>
</tr>
<tr>
<td>Brain trauma</td>
<td></td>
</tr>
<tr>
<td>Inflammation</td>
<td></td>
</tr>
<tr>
<td>Heat and Cold Exposures</td>
<td></td>
</tr>
<tr>
<td>Diet</td>
<td></td>
</tr>
<tr>
<td>Sleep Deprivation</td>
<td></td>
</tr>
<tr>
<td>Communicative Diseases Present</td>
<td></td>
</tr>
<tr>
<td>Non-communicative (environmental) Diseases</td>
<td></td>
</tr>
<tr>
<td>Chronic psychological Stress</td>
<td></td>
</tr>
<tr>
<td>Aging</td>
<td></td>
</tr>
<tr>
<td>Lifestyle Choices</td>
<td></td>
</tr>
</tbody>
</table>

TABLE II: PARAMETERS SHOWN TO INCREASE THE LIKELIHOOD OF AD ONSET AND REPRESENTATIVE REFERENCES FOR EACH

<table>
<thead>
<tr>
<th>Parameter</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air pollution</td>
<td>Block &amp; Calderon-Garcidueñas, 2009; Moulton &amp; Yang, 2012; Carey, et al., 2018; Kilhan &amp; Kitazawa, 2018</td>
</tr>
<tr>
<td>Pesticides</td>
<td>Yan, et al., 2016</td>
</tr>
<tr>
<td>Heavy metals</td>
<td>Adlard &amp; Bush, 2018; Lee, et al., 2018</td>
</tr>
<tr>
<td>Radiation</td>
<td>Tang, 2018; Lehrer, et al., 2017</td>
</tr>
<tr>
<td>Smoking</td>
<td>Ott, et al., 1998; Durazzo, et al., 2014a</td>
</tr>
<tr>
<td>Brain injury</td>
<td>Turner, et al., 2016; Yuan &amp; Wang, 2018; Brenung, et al., 2013</td>
</tr>
<tr>
<td>Chronic inflammation</td>
<td>Duna, et al., 2005; Mistak, et al., 2012; Trempe &amp; Lewis, 2018</td>
</tr>
<tr>
<td>Infectious diseases - viral, fungal, bacterial and parasitic</td>
<td>Honjo, et al., 2009; D'Autto, et al., 2010; Karim, et al., 2014; Schacka, et al., 2017; Emmer, et al., 2018; Headread, et al., 2018</td>
</tr>
<tr>
<td>Diet</td>
<td>Luchbanger, et al., 2002</td>
</tr>
<tr>
<td>Traumatic brain injury</td>
<td>Yangun, et al., 2017; Ramos-Cejudo, et al., 2018</td>
</tr>
<tr>
<td>Chronic Psychological stress</td>
<td>Machado, et al., 2014; Profenno, et al., 2010; Naderali et al., 2011; Alford, et al., 2018</td>
</tr>
<tr>
<td>Obesity</td>
<td>Profenno, et al., 2010; Naderali et al., 2011;</td>
</tr>
<tr>
<td>Blood brain barrier breakdown</td>
<td>Lockehead, et al., 2010; Nation, et al., 2019</td>
</tr>
<tr>
<td>Aging</td>
<td>Dato, et al., 2013; Concioni, et al., 2013;</td>
</tr>
<tr>
<td></td>
<td>Guillaumet-Adkins, et al., 2017</td>
</tr>
</tbody>
</table>

DOI: http://dx.doi.org/10.24018/ejmed.2019.1.1.16
Injuries and Conditions

Total age and weight checks

Genetics and epigenetics
Jung, et al., 2013; Dato, et al., 2013;
Gaulliuinet

Family history
Adkins, et al., 2017; Cencioni, et al., 2013;
National Institute of Aging, 2015

AD co-morbidities

| TABLE III: OXIDATIVE STRESS INDEX (OSI) CHECK LIST |
|---------------|------------------|
| GENDER Female | Male             |
| AGE OF ONSET  |                  |
| FAMILY HISTORY|                  |
| Mother with Alzheimer's disease |   |
| Father with Alzheimer's disease |   |
| Siblings with Alzheimer's disease (put one check for each sister or brother) |   |
| Grandmother with Alzheimer's disease (put one check for each grandmother) |   |
| Grandfather with Alzheimer's disease (put one check for each grandfather) |   |

Total Family History Checks ___

AGE
Check all age boxes that apply. If, for example, you are 55 years old check the first two boxes. If you're 82, check all 5 of these boxes

| 40 or older | 50 or older | 60 or older | 70 or older | 80 or older |

WEIGHT
Find your healthy weight, on the weight chart (see table 2.2 on page 46). Check all the weight boxes that apply. If, for example you are 40 pounds over your recommended weight, check the first three boxes and add three checks to the total.

Find your recommended weight on the weight chart at the end of the OSI checklist.

| 10 - 20 pounds overweight | 21 - 40 pounds overweight | 41 - 60 pounds overweight | 61 - 80 pounds overweight | 81 or more pounds overweight |

Total age and weight checks

ILLNESSES and CONDITIONS
Check all illnesses or conditions that you have been diagnosed with and currently have.

Acne
ADHD (Attention Deficit Hyperactivity Disorder)
AIDS or HIV
Alcohol addiction
Allergic rhinitis (sinus inflammation)
ALS (Lou Gehrig's disease)
Anemia
Anorexia
Anxiety disorder
Appetite loss
Arthritis
Asthma
Autism and ASD
Benign prostate hyperplasia (enlargement - BPH)
Bipolar disorder
Bronchitis (chronic)
Bulimia
Bulging or herniated disc
Carpal tunnel syndrome
Cancer - Check all that apply. If stage three, for example, check first three.
Cancer - Check all that apply. If stage three, for example, check first three.
Cancer - stage 1
Cancer - stage 1 or 2
Cancer - stage 1, 2 or 3
Cancer - stage 1, 2, 3 or 4
Cardiovascular disease
Chronic Fatigue Syndrome (CFS)
Crohn's disease
Common cold (frequent)
COPD (chronic obstructive pulmonary disease)
Cystic Fibrosis (CF)

Disease Checks ___

DISEASE START

How many of...
the diseases checked above started in

- The past 2 years?
- The past 5 years?
- The past 10 years?

SYMPTOMS

- Check all the symptoms that you currently experience.

- Abdominal pain (frequent)
- Allergic reactions to chemicals
- Allergic reactions to any foods
- Allergic reactions to insects
- Allergic reactions to medications
- Allergic reactions to plants (Hay fever)
- Ankle pain
- Attention span decline
- Anxiety often
- Bleeding gums
- Blood in stool
- Blood in urine
- Blurred or cloudy vision
- Bruise easily
- Burning when urinating
- Butterflies in your stomach often
- Change in skin color
- Chest pain
- Constant chills
- Constipation
- Cough that is persistent
- Coughing or spitting up blood
- Decision making difficulties
- Decline in learning ability
- Decreased eye sight
- Decreased sex drive
- Diarrhea (frequent)
- Difficulty completing familiar tasks
- Difficulty concentrating
- Difficulty getting warm
- Difficulty maintaining balance
- Difficulty solving problems
- Difficulty swallowing
- Difficulty walking
- Difficulty concentrating or finding words
- Dizziness
- Drained of energy
- Dreams that are bizarre and recurring
- Excessive mucous production
- Excessive thirst
- Eye discomfort or pain
- Eye redness
- Fatigue
- Feel depressed a lot
- Feel less alert or fuzzy headed
- Fever
- Food allergies
- Foot pain
- Foot swelling
- Fungal infection such as athlete’s food that persists
- Frequent urination
- Graying of hair
- Hair loss (not due to chemotherapy)
- Have itchy scaly skin rashes
- Headaches frequently
- Hear voices inside you
- Hearing loss that comes on suddenly
- Heart palpitations (throbbing)
- Heartburn
- Hip pain
- Hoarseness
- Increased susceptibility to infections
- Indigestion (frequent)
- Insomnia
- Irregular periods
- Itchy hands
- Itchy skin other than hands
- Jaw pain
- Leg swelling
- Learning new things more difficult
- Light headedness
- Long recovery time from infections
- Losing track of time
- Loss of coordination
- Loss of muscle tone
- Loss of taste
- Lower back pain
- Memory loss
- Mood swings from very high to very low and vice versa
- Mouth sores that don’t go away quickly
- Muscle aches that last a long time
- Muscle cramps
- Muscle spasms
- Nasal congestion
- Nausea
- Neck pain
- Nervousness
- Nightmares regularly
- Nose bleeds
- Knee pain
- Numbness or tingling in hands or feet
- Pain in joints
- Heart palpitations
- Pelvic pain
- Perspire (sweat) profusely
- Post nasal drip that lingers
- Post traumatic stress disorder (PTSD)
- Problems finding the words you want
- Rapid hair loss
- Rapid heartbeat
- Scaly skin
- Seizures
- Shortness of breath
- Shoulder pain that lingers
- Sinus pain
- Skin mole growth
- Skin rashes
- Sleep less than 7 hours per night
- Sleep more than 9 hours a night
- Slow to heal from cuts, bruises or other injuries
- Slurred speech
- Smaller field of vision
- Sore throat that doesn’t heal
- Stressed out most or all of the time
- Stuffy nose
- Swollen eye lids
- Tics (involuntary movements)
- Tingling in the hands or feet
- Tire easily
- Tired most of the time
- Tooth pain
- Tremors
- Twitching
- Unusual vaginal bleeding or discharge
- Urination difficulty
- Urination pain
- Varicose veins
- Vomiting
- Wake up more than 3 times per night
- Weakness
- Weight gain
- Weight loss (rapid)
- Wheezing
- Wrinkling or loss of tone in skin
- Yawning frequently

Total Symptoms Checks

TEST RESULTS

The following address results obtained from test doctors ordered done as part of annual examinations. Check all that apply to you.

- High or low blood sugar
- High or low BUN (blood urea nitrogen)
- High or low calcium
- High or low carbon dioxide (bicarbonate)
- High or low chloride
- High cholesterol
- High or low creatinine
- High glucose
- High or low potassium
- High PSA
High or low sodium  
High triglycerides  
Low blood oxygen  
Low potassium

**Total Test Results Checks**

**PRESCRIPTION MEDICINES REGULARLY TAKEN**
Check each of the boxes that apply. If you regularly take five prescription drugs, for example, check **all** of the first 5 items, so that the total number of items checked equals the total number of prescriptions regularly taken.

- 1 prescription
- 2 prescriptions
- 3 prescriptions
- 4 prescriptions
- 5 prescriptions
- 6 prescriptions
- 7 prescriptions
- 8 prescriptions
- 9 prescriptions
- 10 or more prescriptions

Have a heart pacemaker

**DIET**

Check each item that applies to the foods that are part of your regular eat.

- Alcoholic beverages (beer, wine, spirits) more than 1 drink per day
- Artificial sweeteners for coffee or tea
- Canned or frozen foods regularly eaten (soups, pastas, meats)
- Bread and pasta made primarily from white processed flour
- Fast food frequently eaten
- Fewer than 2 fruits or vegetables a day
- Grilled, smoked or blackened meat, chicken or fish
- Food high in fat (whole milk, cheeses, foods cooked with butter and animal fat)
- Often eat processed foods (bacon, hot dogs, salami, sausages, deli meats)
- Eat red meat more than 2 times a week
- Eat foods high in sugar (sweetened drinks and desserts)
- Salty food

**Total Diet Checks**

**LIFE STYLE**

These items refer to where you live, the type of work you do and chemicals you may be exposed to.

- Are a farmer that regularly uses pesticides
- Burn wood for heat or for cooking
- Constantly use a cell phone
- Drink chlorinated water
- Drink more than one alcoholic drink per day
- Exercise less than one half hour a week
- Have mold in your home
- Have new (less than 6 months old) carpet in your home
- Have pets in your home that you are allergic to
- Live down wind from a smoking industrial chimney
- Live in a city with air quality alerts
- Live or work close to a cell tower
- Live or work near high voltage electrical transmission lines
- Live near a heavily traveled highway or road
- Live near a landfill
- Live with a smoker
- Regularly experience allergic reactions in your home
- Regularly experience allergic reactions in your work place
- Regularly use room or furniture deodorants
- Regularly play contact sports
- Tobacco use. Check **all** of the items that apply. For example, if you smoke one pack of cigarettes a day, check both of the first 2 items. If you smoke two packs a day, check **all** of the first 4 items
- Smoke 10 cigarettes or less daily (even just one)
- Smoke a pack a day (20 cigarettes)
- Smoke a pack and a half a day (30 cigarettes)
- Smoke two packs a day (40 cigarettes)
- Smoke more than two packs a day
- Smoke 1-5 cigars a day
- Smoke 6 or more cigars a day
- Use smokeless tobacco
- Work as a toll booth collector
- Work in a noisy environment
- Work in a restaurant
- Work in a store or food service
- Work in a traffic signal
- Work in a railroad yard
- Work in a polluted environment (road paver, toll booth operator, for example)
- Work in a water or sewage treatment plant
- Work in wood treatment plant

**Total Lifestyle Checks**

**OSL, Total of All Checks**

**REFERENCES**


DOI: http://dx.doi.org/10.24018/ejmed.2019.1.1.16


