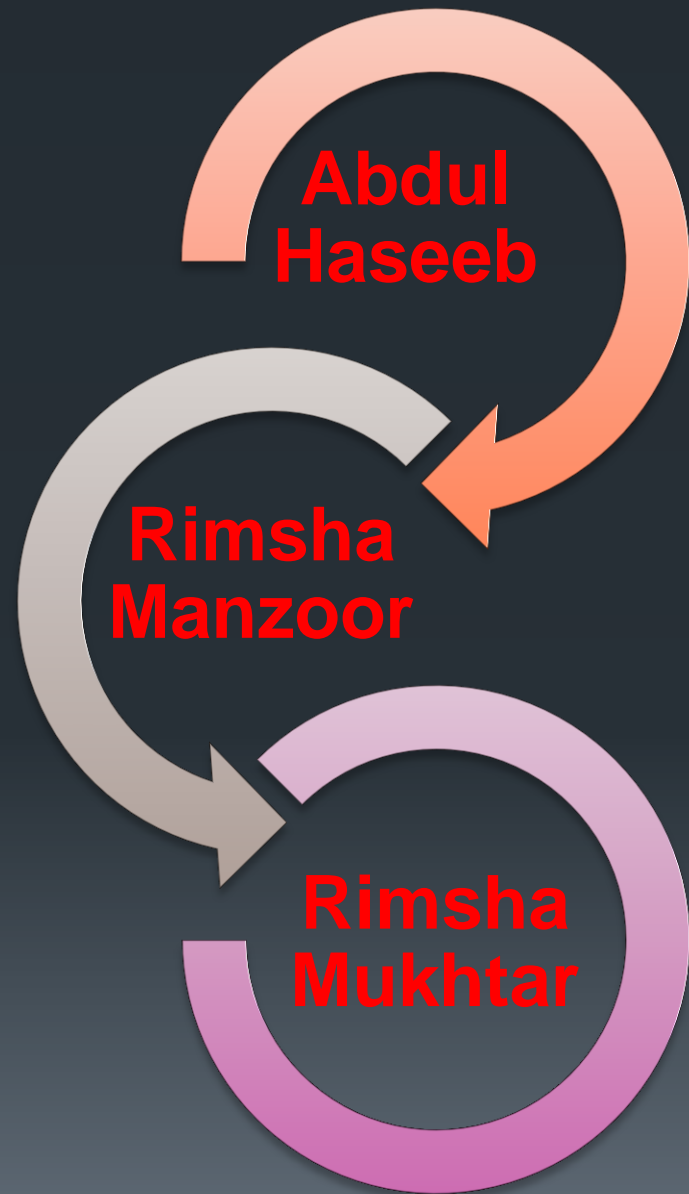
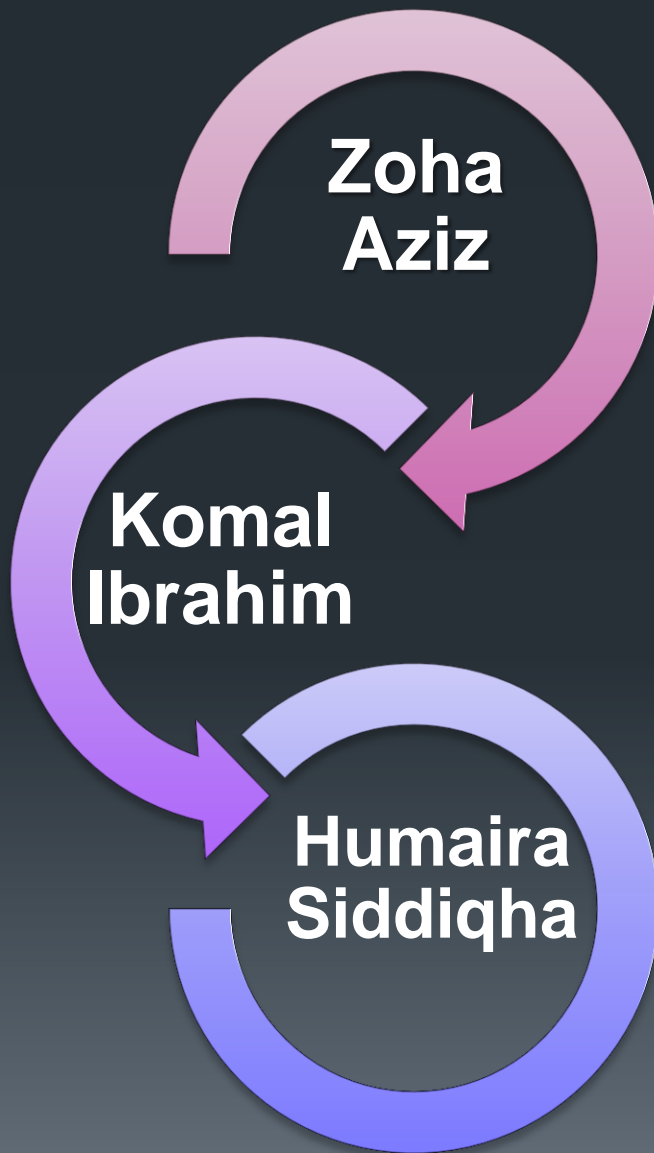




# *Attention Deficit Hyperactivity Disorder (ADHD)*

# GROUP MEMBERS





# **Attention Deficit Hyperactivity Disorder**


# What is ADHD.....?

- **Attention deficit hyperactivity disorder (ADHD)** is a mental disorder of the neurodevelopmental type. It is characterized by difficulty paying attention, excessive activity and acting without regards to consequences.

# ADHD ?

- A condition affecting children and adults
- Characterized by problems with:



- 
- • **Inattention** means a person wanders off task, lacks persistence, has difficulty sustaining focus, and is disorganized; and these problems are not due to defiance or lack of comprehension.
  - • **Hyperactivity** means a person seems to move about constantly, including in situations in which it is not appropriate; or excessively fidgets, taps, or talks. In adults, it may be extreme restlessness or wearing others out with constant activity.
  - • **Impulsivity** means a person makes hasty actions that occur in the moment without first thinking about them and that may have a high potential for harm, or a desire for immediate rewards or inability to delay gratification.

# HISTORY OF ADHD

- Mid-1800s: Minimal Brain Damage
- Mid 1900s: Minimal Brain Dysfunction
- 1960s: Hyperkinesia
- 1980: Attention-Deficit Disorder
  - With or Without Hyperactivity
- 1987: Attention Deficit Hyperactivity Disorder
- 1994 (DSM IV): ADHD
  - Primarily Inattentive
  - Primarily Hyperactive
  - Combined Type



# Subtypes

**Predominately  
Inattentive**

**Predominately  
Hyperactive-Impulsive**


**Combined type**



**Attention Deficit Hyperactivity Disorder**



**SIGNS &  
SYMPTOMS**

- 
- Inattention and hyperactivity/impulsivity are the key behaviors of ADHD. Some people with ADHD only have problems with one of the behaviors, while others have both inattention and hyperactivity-impulsivity. Most children have the combined type of ADHD.

In preschool, the most common ADHD symptom is hyperactivity.

It is normal to have some inattention, unfocused motor activity, and impulsivity, but for people with ADHD, these behaviors:

- • are more severe
- • occur more often
- • interfere with or reduce the quality of how they function socially, at school, or in a job

# Inattention

People with symptoms of inattention may often:

- ❑ Overlook or miss details, make careless mistakes in schoolwork, at work
- ❑ Have problems sustaining attention in tasks or play, including conversations, lectures
- ❑ Not seem to listen when spoken to directly
- ❑ Not follow through on instructions and fail to finish schoolwork, or duties in the workplace

# Inattention Contd....

- ❑ Have problems organizing tasks and activities, such as what to do in sequence
- ❑ Avoid or dislike tasks that require sustained mental effort, such as schoolwork or homework
- ❑ Be easily distracted by unrelated thoughts or stimuli
- ❑ Be forgetful in daily activities

# Hyperactivity-Impulsivity



People with symptoms of hyperactivity-impulsivity may often:

- ❑ Fidget and squirm in their seats
- ❑ Leave their seats in situations when staying seated is expected, such as in the classroom or the office
- ❑ Run or dash around or climb in situations where it is inappropriate or, in teens and adults, often feel restless
- ❑ Be unable to play or engage in hobbies quietly
- ❑ Talk nonstop

## Hyperactivity-Impulsivity Contd.....

- ❑ Be constantly in motion or “on the go,” or act as if “driven by a motor”
- ❑ Blurt out an answer before a question has been completed, finish other people’s sentences
- ❑ Have trouble waiting for his or her turn
- ❑ Interrupt or intrude on others, for example in conversations, games, or activities

# ETIOLOGY



- ❑ No single factor determines the expression of ADHD;
- ❑ Mothers of children with ADHD are more likely to experience birth complications, such as toxaemia, lengthy labour, and complicated delivery
- ❑ Maternal smoking and alcohol use during pregnancy and prenatal or postnatal exposure to lead are commonly linked the development of ADHD.
- ❑ There is a strong genetic component to ADHD. [dopamine transporter gene (DAT1) and a particular form of the dopamine 4 receptor gene (DRD4)]. There are some other genes that might contribute to ADHD.

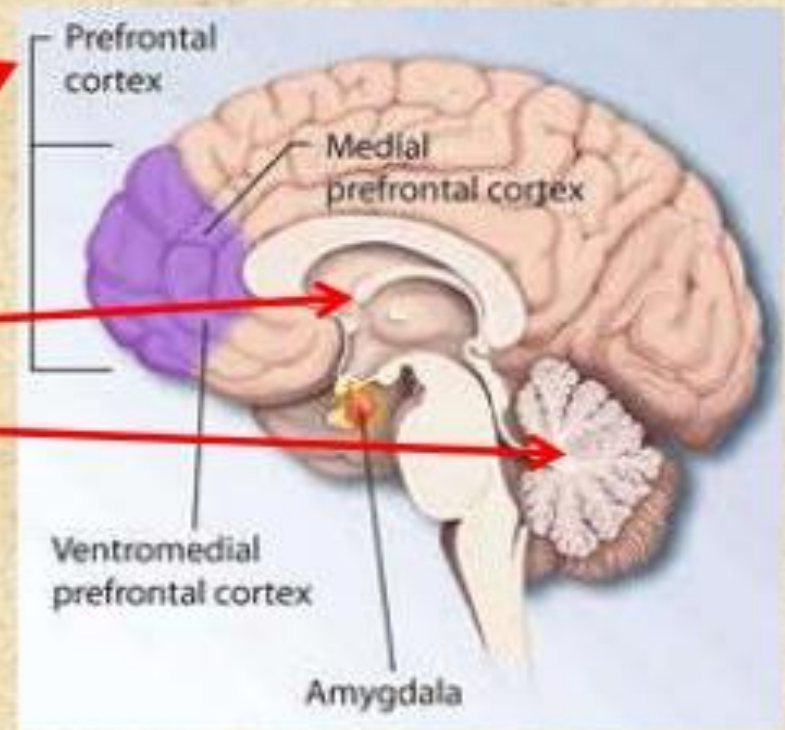
# ETIOLOGY CONT...

- ❑ Severe traumatic brain injury with subsequent onset of substantial symptoms of impulsivity and inattention are reported in some children.
- ❑ Structural or functional abnormalities have been identified in children with ADHD without pre-existing identifiable brain injury. These include dysregulation of the frontal subcortical circuits, small cortical volumes in this region, widespread small-volume reduction throughout the brain. abnormalities of the cerebellum.
- ❑ Psychosocial family stressors can also contribute to or exacerbate the symptoms of ADHD.

# PATHOGENESIS

- Lower activity in brain regions associated with executive function (particularly abnormalities in frontostriatal circuit):

- Prefrontal cortex
- Basal ganglia
- Cerebellum(vermis)



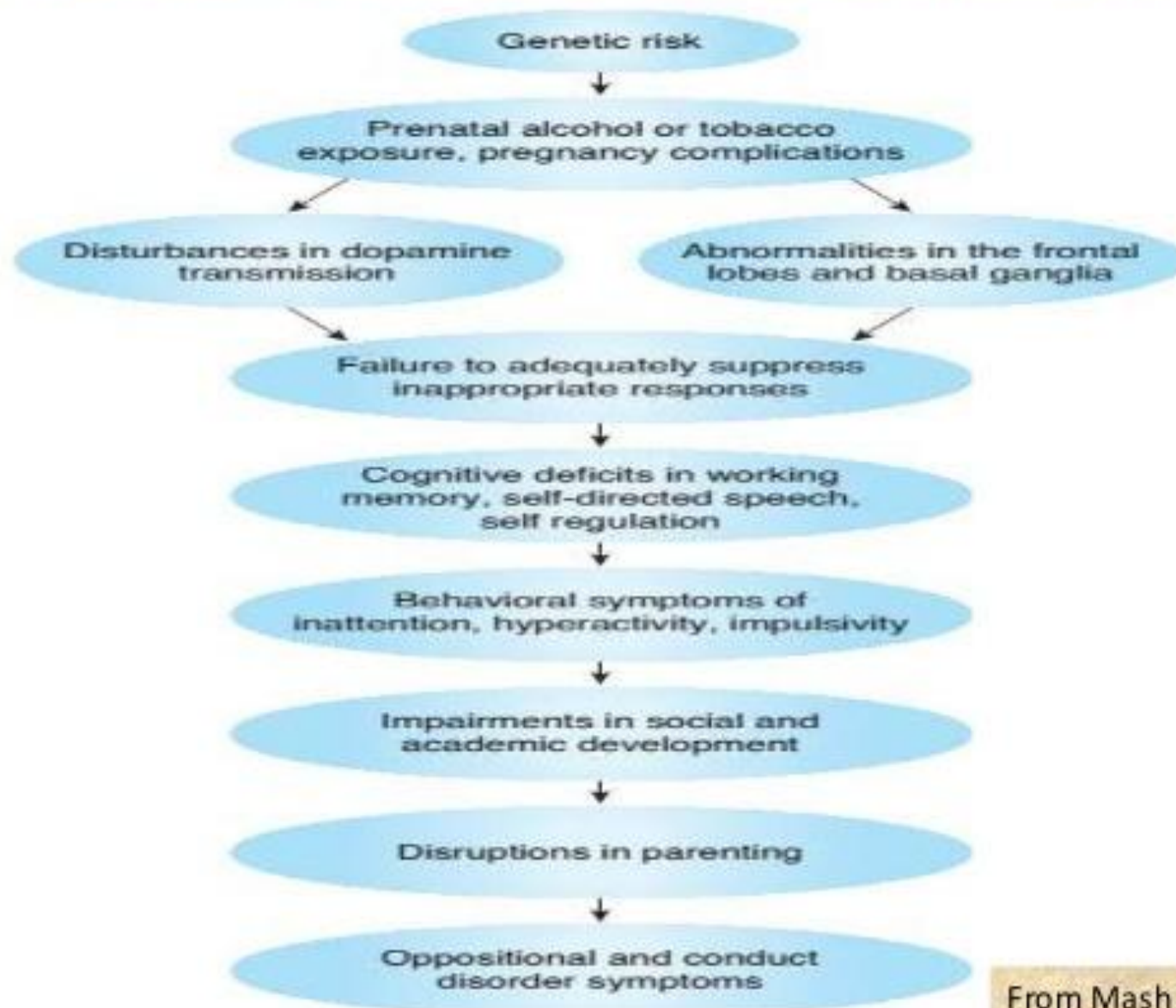
- These areas of the brain are associated with executive function abilities:

- ☐ Attention, **spatial working memory**, and short-term memory.
- ☐ **Response inhibition** and set shifting.

## Cont.

- Abnormal central dopaminergic and noradrenergic tone.
  - ¶ Dopamine has been associated with approach and pleasure-seeking behaviors.
  - ¶ Norepinephrine plays a role in emotional/behavioral regulation.
- Smaller brain volume in prefrontal cortex, caudate nucleus, and vermis of the cerebellum. (a 5-10% reduction in these brain structures)

# A Possible Developmental Pathway for ADHD



From Mash & Wolfe, 2007

## Comorbid disorders:

Prevalence of comorbid disorders for children with ADHD vs those without

	No ADHD	ADHD
Learning disability (%)	5.3	46.1 <sup>a</sup>
Conduct disorder (%)	1.8	27.4 <sup>a</sup>
Anxiety (%)	2.1	17.8 <sup>a</sup>
Depression (%)	1.4	13.9 <sup>a</sup>
Speech problem (%)	2.5	11.8 <sup>a</sup>
Autism spectrum disorder (%)	0.6	6.0 <sup>a</sup>
Hearing problem (%)	1.2	4.2 <sup>a</sup>
Epilepsy or seizures (%)	0.6	2.6 <sup>a</sup>
Vision problem (%)	1.4	2.3 <sup>a</sup>
Tourette's syndrome (%)	0.09	1.3 <sup>a</sup>

***Treatment  
and  
Therapies***



## **TREATMENT :**

No treatments have been found to cure this disorder, but many treatments exist results in the greatest degree of improvement in the symptoms of the disorder.

### **Psychosocial Treatments**

- The parents and child should be educated with regard to the ways ADHD can affect learning, behavior, self-esteem, social skills, and family function.
- The clinician should set goals for the family to improve the child's interpersonal relationships, develop study skills, and decrease disruptive behaviors.

## **Behaviorally Oriented Treatments :**

- The goal of such treatment is for the clinician to identify targeted behaviors that cause impairment in the child's life (disruptive behavior, difficulty in completing homework, failure to obey home or school rules)
- The clinician should guide the parents and teachers in implementing rules, consequences, and rewards to encourage desired behaviors.
- Behavioral interventions are only modestly successful at improving behavior, but they may be particularly useful for children with complex comorbidities and family stressors, when combined with medication.

## Medications :

The most widely used medications are the pre synaptic dopaminergic agonists, commonly called psychostimulant medications

- ¶ Over the first 4 wk of treatment, the physician should increase the medication dose as tolerated (keeping side effects minimal to absent) to achieve maximum benefit.
- ¶ If this strategy does not yield satisfactory results, or if side effects prevent further dose adjustment in the presence of persisting symptoms, the clinician should use an alternative class of stimulants that was not used previously.
- ¶ If satisfactory treatment results are not obtained with the second stimulant, clinicians may choose to prescribe atomoxetine, a noradrenergic reuptake inhibitor. .

## STIMULANTS:

### Methylphenidate:

- Available in immediate and sustained release.
- Absorption: From the GI tract, slow and incomplete
- Dose(Ritalin): 5mg (0.3mg/kg/dose) PO BID before breakfast and lunch.
  - Increase by 5-10mg/day (0.2mg/kg/day) at weekly intervals.
  - Max = 60mg/day (2mg/kg/day).
- Once dose is determined, can switch to longer acting agent (Concerta ~20% IR and 80% ER, Metadate ~30% IR and 70% ER, Ritalin LA ~50% IR and 50% delayed 4hrs).

## Amphetamines:

- Dextroamphetamine (single salt) - 5mg PO once or twice daily MAX: 40mg/day.
- Mixed amphetamine salts -
  - >6 years old 5mg PO once or twice daily; MAX:40mg/day (5-6 yr start at start with 2.5 mg ),
  - 10mg PO(for SR product); MAX: 30mg/day.
- Lisdexamphetamine (prodrug) –
  - 6-8 years old: 20 mg PO-- MAX 70 mg/day.
  - >8 years old: 30mg PO --MAX: 70 mg/day.
  - May increase in increments of 10-20 mg/day at weekly intervals till max dose until optimal response is obtain.

## **Dexmethylphenidate**

- D-threo-enantiomer of methylphenidate.
- Better absorbed.
- Initial Dose: 2.5mg PO BID OR 10mg PO (XR).

### **Side effect of stimulant**

- Common: Anorexia, Sleep disturbance, Weight loss, Nervousness/ Restlessness, Growth retardation Increased blood pressure.
- Severe: Tics, Arrhythmia, Psychosis, Sudden cardiac death, drug abuse potential.

## NON-STIMULANTS

- Usually second-line treatments
  - If stimulants are poorly tolerated or ineffective
  - As monotherapy or adjunct to stimulants

### Atomoxetine

- MOA: selective nor epinephrine reuptake inhibitor.
- Second-line treatment or alternative for patients with history of drug abuse.
- Dose: 0.5mg/kg, then titrate up every 3 days to 1.2mg/kg in either 1 or 2 daily doses
- Max = 1.4mg/kg or 100mg (whichever is less)
- Side Effects:
  - Common: weight loss, abdominal pain, appetite suppression, sleep disturbance
  - Serious: rare but severe liver injury
  - suicidal ideation

- **Clonidine and Guanfacine**
  - MOA: alpha-2 adrenergic agonist.
  - Provides modest reduction in ADHD symptoms by reducing impulsivity, hyperactivity and improving sleep.
  - Must taper slowly- risk for rebound hypertension.
- **Desipramine**
  - MOA: inhibit NE and serotonin.
  - SE: anticholinergic effects, lowers seizure threshold, CV effects.
- **Bupropion**
  - MOA: inhibits NE and DA.
  - Equivalent to methylphenidate.
  - SE: tics, lowers seizure threshold.
- **Others--** Iron May augment effects of stimulant therapy in adolescent patients with low ferritin.

## **Follow up:**

- Every 1-3 weeks during initial titration.
- Every 3-6 months thereafter.
- Assess treatment response through validated behavioral ADHD rating scales (Patients, parents and teachers)
- Monitor height and weight during stimulant therapy

## **Stopping Therapy**

- Consider stopping if patient is stable and doing well. Stop for 1-4 weeks then reevaluate.

# REFERENCES

- NELSON TEXTBOOK OF PEDIATRICS, 20th EDITION
- KAPLAN & SADOCK'S COMPREHENSIVE TEXTBOOK OF PSYCHIATRY, 9th EDITION
- MASH & WOLFE ABNORMAL CHILD PSYCHOLOGY, 4th EDITION
- Journal of PEDIATRICS Volume 127, Number 3, March 2011

THE END