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Exercise the Art Pediatrics Diagnosis Through Systematic Clinical Survey



N Ravi Kumar

JAYPEE

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CHAPTER

4

Symptomatology and Examination of CVS in Children

COMPLAINTS

- Difficulty/rapid breathing (infants/toddler)
- Shortness of breath (older children)
- Bluish discoloration of body, tongue
- Cyanotic spell—increased pre-existing cyanosis, tachypnea, squatting/equivalent position may be followed by seizures
- Growth retardation/failure to thrive (FTT)
- Easy fatigability, feeding difficulties due to respiratory distress (RD)
- Suck rest suck cycle, sweating, congestive cardiac failure (CCF)
- Older child—syncope, chest pain, arthritis, palpitations
- Some may complain of increased pericardial activity (L-R shunts, Regurgitation lesions)
- Right hypochondriac pain, jaundice, pedal edema (Right heart failure)
- Grading of symptoms in infants is very difficult. Rapid breathing at rest indicates class IV and during feeding indicates class II. Grading indicates severity of underlying lesion
- In infants, differentiation of cardiac RD from respiratory cause is difficult. Recurrent respiratory tract infections may be due to cardiac lesions.

GENERAL EXAMINATION

Heart Rate/Pulse Rate

Pulse

Character, volume, radioradial delay (takayasu arteritis), radiofemoral delay (coarctation of aorta, aortoarteritis), absence of pulse in the absence of CCF advanced stage great vessel vasculitis (pulse less disease).

RR

For every one rate raise of RR, HR increase by four. In cardiac failure, there is a disproportionate increase in HR. More of tachypnea is there than respiratory distress.

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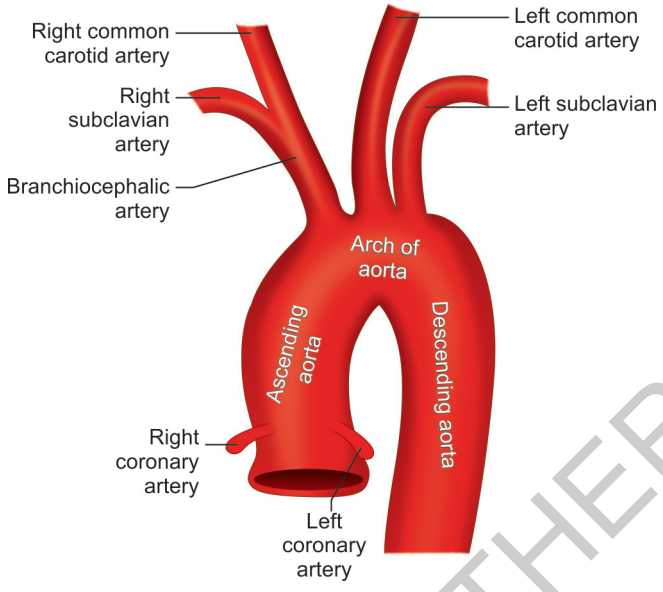


Fig. 1: Aortic arch branches

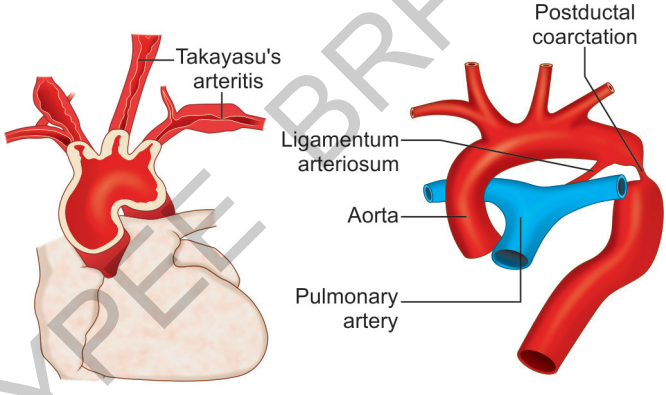


Fig. 2: Narrowing of arterial vessel

BP

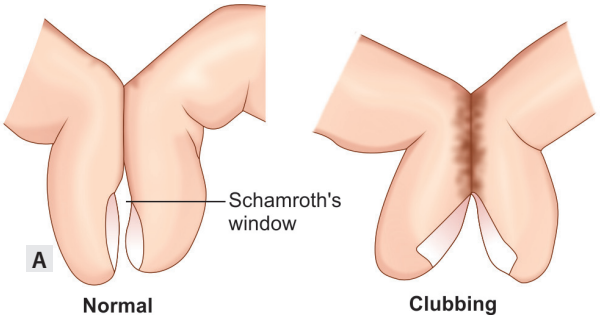
Blood pressure should be recorded in three limbs. Record pulse pressure.

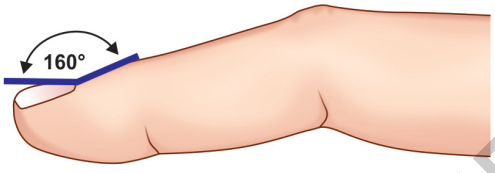
Finger Clubbing

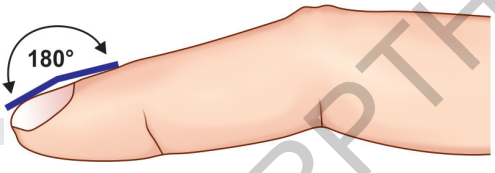
Clubbing may be present in one of four stages (Fig. 3A to D):

1. Fluctuation and softening of the nail bed (increased ballotability).
2. Loss of the normal <165° angle between the nail bed and the fold.
3. Increased convexity of the nail fold.
4. Thickening of the whole distal (end part of the) finger (resembling a drumstick).

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Grade 3—Parrot beaking



Grade 4—Drumstick appearance

Figs 3A to D: Finger clubbing—(A) Normal; (B) Clubbing, loss of the normal angle between the nail bed and the fold; (C) Grade 3 parrot beaking; (D) Grade 4 drumstick appearance

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CYANOSIS

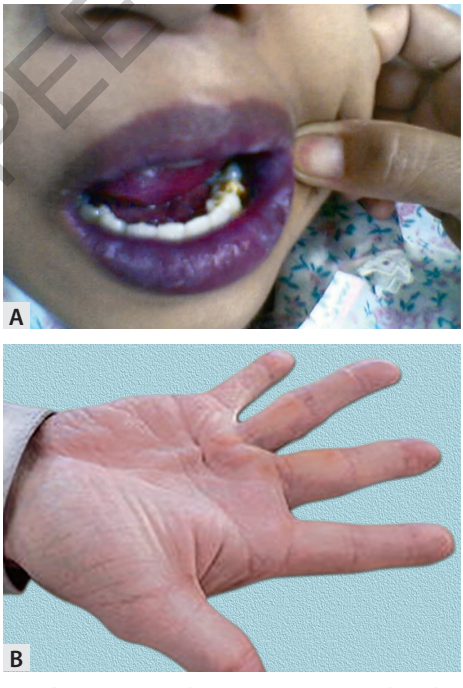
Bluish discoloration of the skin and mucous membrane due to an increased quantity of reduced hemoglobin >5 g per dL or >30% of total Hb and PaO_2 <85% or due to the presence of abnormal hemoglobin pigments in the blood. Presence of cyanosis in the absence cardiac disease—methmoglobinemia congenital cardiac failure, hepatic cyanotic heart disease has two types

Types of Cyanosis (Figs 4A and B)

Features	Central Cynosis	Peripheral Cynosis
Mechanism	Rt to Lt shunts/lung disease	Peripheral stasis
Site	Whole body	Nail beds, nosetip, extremities
Associations	Clubbing, ploycythemia	–
Extremities	Warm	Cold
On warming	No change	Disappears
PaO_2	<85%	85–100%

Other Symptoms

- Jaundice
- Pallor (Anemia)
- Polycythemia (Cyanotic heart disease had increased hematocrit)
- High-arch palate (Marfan's)



Figs 4A and B: (A) Central cayanosis; (B) Peripheral cyanosis

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- Low set ears
- Webbed neck
- Syndactyly, polydactyly, arachnodactyly
- Cubitus valgus, absent radius.

Markers of Rheumatic Fever

- Joint swelling
- Subcutaneous nodules
- Erythema marginatum.

Markers of Infective Endocarditis

- Anemia
- Splinter hemorrhages
- Osler's nodes
- Jane way lesions
- Arthritis.

Fundus Examination

- Infective endocarditis—Roth's spots
- Hypertensive retinopathy.

Teeth

- Dental caries.

Jugular Venous Pulse (JVP)

It is possible only in older children (Fig. 5).

Inspection

- Bulging/normal pericardium
- Visible pericardial pulsations (parasternal, epigastric.Lt 2 ICS)
- Dilated veins
- Surgical scars
- Apical impulse (before starting, first look for trachea and vertebral column position).

Palpation of the Precordium

General rule: The finger tips are used to feel pulsations, the base of fingers for thrills and hand base for heaves. Ideal position is supine or upper trunk elevated to 30 degree.

- Apex—lower most and outer most point of cardiac impulse
- The apex is normally located 1/2–1 cm medial to left mid-clavicular line in 5th space
- Up to 2 years of age, the apex may normally be in 4th space in MCL
- After 4–5 years apex assumes adult location

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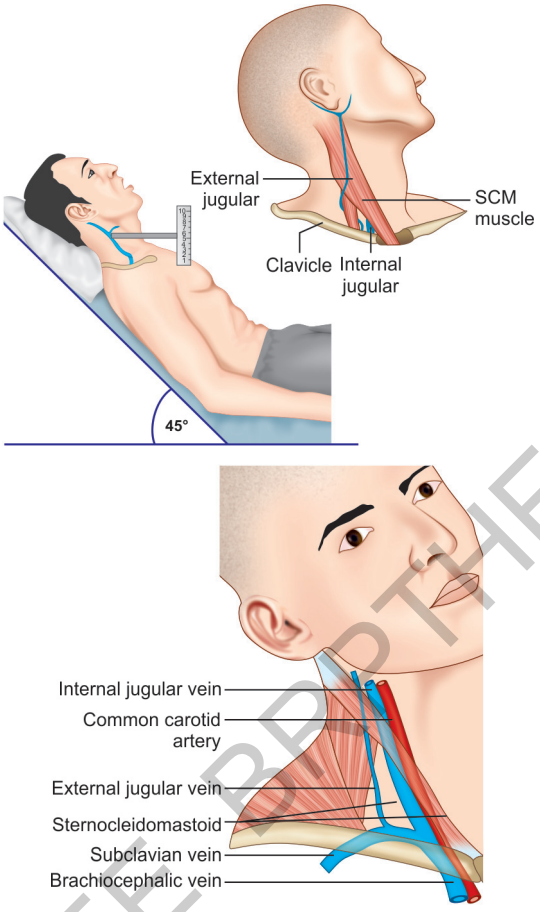


Fig. 5: Jugular venous pulse

- Palpate parasternal, epigastric pulsations
- Palpate thrills, P2, ejection clicks.

Percussion of the Heart Borders

Percussion of the heart borders is rarely performed during physical examination. The borders of the heart are better identified by radiologic examination.

Auscultation of the Heart

Areas of Auscultation over Precordium (Fig. 6)

- Mitral area corresponds to cardiac apex
- Tricuspid area corresponds to the lower left parasternal area
- Aortic area corresponds to the 2nd right intercostal space close to the sternum
- Pulmonary area corresponds to the 2nd left intercostal space close to the sternum

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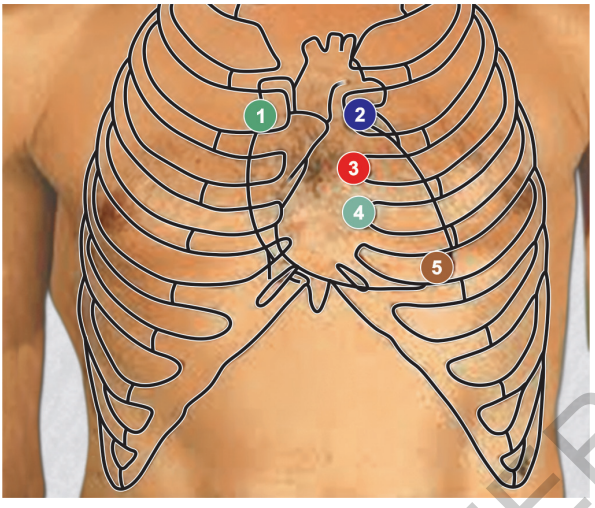


Fig. 6: Areas of auscultation over precordium

- ERB's area corresponds to the 3rd left intercostal space close to the sternum
- Gibson's area corresponds to the first left intercostal space close to the sternum. PDA murmur is best heard here.

Other areas

- Carotids
- Inter- and infrascapular areas
- Axilla.

The Heart is auscultated for

- Heart sounds
- Presence of murmur
- Presence of added sounds (O3, O4, os, pericardial rub, diastolic knock, tumor plop, prosthetic valve sounds)
- Comment S1 in mitral area-intensity of sound/muffled/soft
- Comment S2 in pulmonary area—intensity/splitting
- Gallop—Triple rhythm with tachycardia
- Murmur should be described in the following way:
  - Timiming, character, grading, pitch, best heard area, radiation, variation with respiration, variation with postures.

Murmurs are classified by the following characteristics:

- Intensity: How loud is it? Can a thrill also be palpated?
- Location: Where is the murmur the loudest? Identify the listening area and precise topographic landmarks. Is the child sitting or lying down?
- Radiation: Is the sound transmitted over a larger area of the chest, to the axilla, or to the back?
- Timing: Is the murmur heard best after S1 or S2? Is it heard during the entire phase between S1 and S2?

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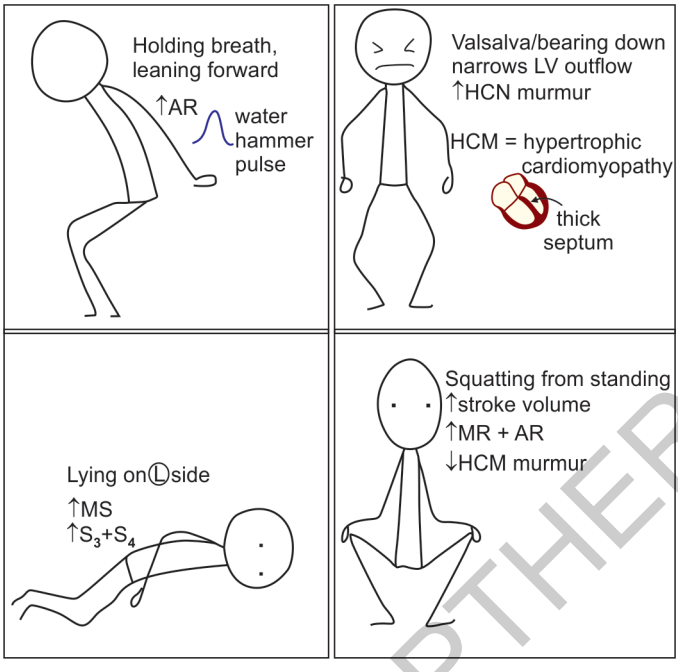
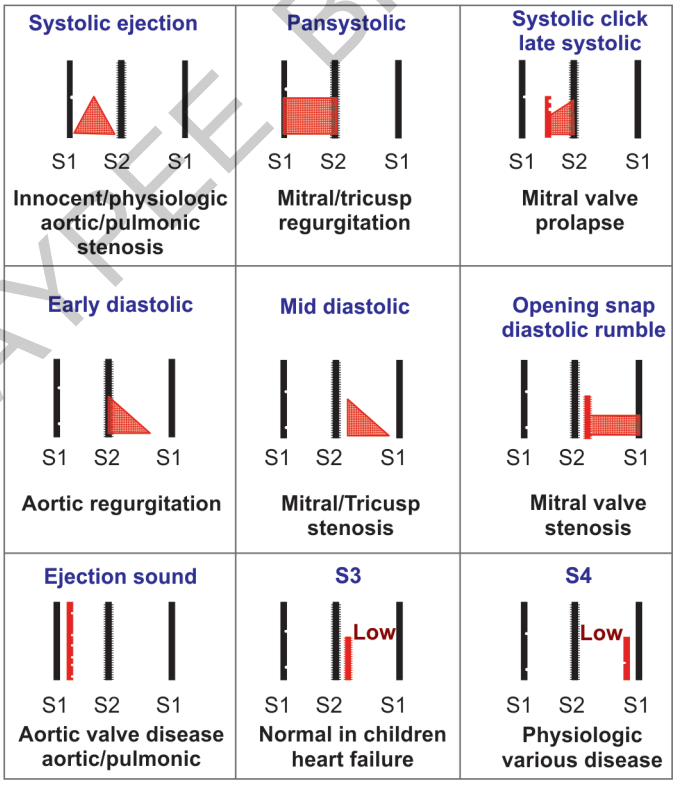


Fig. 7: Position for best hearing of various murmurs



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- Quality: Describe what the murmur sounds like—for example, machine-like, musical, or blowing.

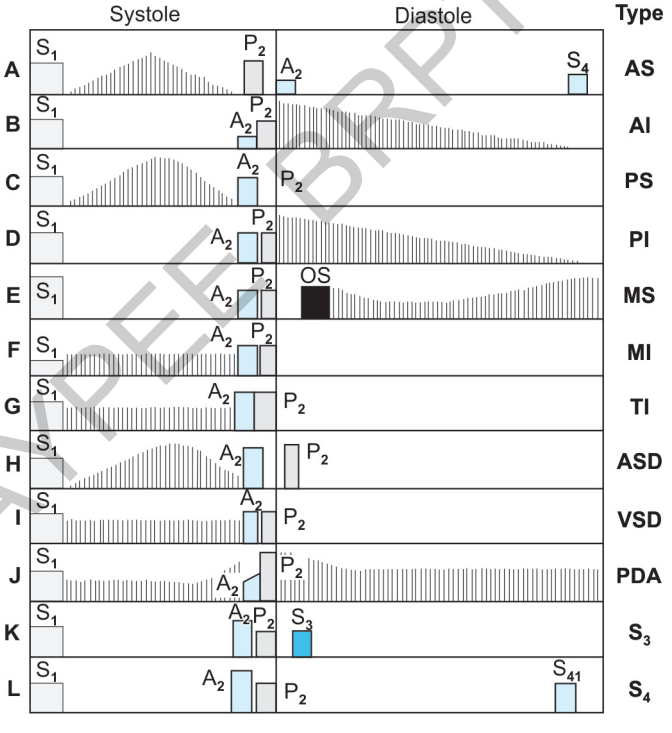
The grading of heart murmur is given in Table 1 along with description.

Table 1: Grading heart murmur

Grade	Description
1	Soft murmur heard only under quiet conditions
2	Soft murmur heard under even noisy conditions
3	Easily heard prominent murmurs
4*	Loud murmur associated with a thrill
5	Loud murmur with the edge of the stethoscope tilted against the chest plus a thrill
6	Very loud murmur that can be heard 5–10 mm from the chest plus a thrill

*Note: Diastolic murmurs are only graded to grade 4

MURMURS HEARD IN DIFFERENT LESIONS



GROWTH AND DEVELOPMENT

The child's heart rate varies with age, decreases as the child grows older.

The heart rate also increases in response to exercise, excitement, anxiety, and fever.

Such stresses increase the child's metabolic rate, creating a simultaneous need for more oxygen. Children respond

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to the need for more oxygen by increasing their heart rate, a response called sinus tachycardia. They cannot increase their cardiac stroke volume to deliver more oxygen to the tissues as adults do.

AGE	Heart rate range (beats/min)	Average heart rate
New borns	100–170	120
Infants to 2 years	80–130	110
2–6 years	70–120	100
6–10 years	70–110	90
10–16 years	60–100	85

Listen carefully to the heart rate rhythm. Children often have a normal cycle of irregular rhythm associated with respiration called sinus arrhythmia.

With sinus arrhythmia the child's heart rate is faster on inspiration and slower on expiration. When any rhythm irregularity is detected, ask the child to take a breath and hold it while you listen to the heart rate.

The rhythm should become regular during inspiration and expiration. Other rhythm irregularities are abnormal.

Differentiations of Heart Sounds

Heart sounds are due to the closure of the valves and vibration or turbulence of blood produced by that valve closure. Two primary sounds—S1 and S2, are heard when the chest is auscultated.

S1, the first heart sound, is produced by closure of the tricuspid and mitral valves when the ventricular contraction begins. The two valves close almost simultaneously, so only one sound is normally heard.

S2, the second heart sound, is produced by the closure of the aortic and pulmonic valves.

Once the blood has reached the pulmonic and aortic arteries, the valves close to prevent leakage back into the ventricles during diastole. The timing of the valve closure varies with respirations. Sometimes S2 is heard as a single sound and at other times as a split sound, that is, two sounds heard a fraction of a second apart.

Sound is easily transmitted in liquid, and it travels best in the direction of blood flow. Auscultate heart sounds at specific areas on the chest wall in the direction of blood flow, just beyond the valve. The sounds produced by the heart valves or blood turbulence are heard throughout the chest in thin infants and children.

Both S1 and S2 can be heard in all listening areas.

Auscultate heart sounds for quality (distinct versus muffled) and intensity (loud versus weak). First, distinguish between S1 and S2 in each listening areas.

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Heart sounds are usually distinct and crisp in children because of their thin chest wall.

Muffling or indistinct sounds may indicate a heart defect or congestive heart failure.

Document the area where heart sounds are heard the best.

If the child has a potential murmur, auscultate the heart in the sitting, reclining, and standing positions to see if differences are noted by position change.

Splitting of the Heart Sounds

After distinguishing the first and second heart sounds, try to detect physiologic splitting.

A split S2 is more apparent during inspiration when the child takes a deep breath. More blood returns to the right ventricle, causing the pulmonic valve to close a fraction of a second later than the aortic valve. To detect physiologic splitting, auscultate over the pulmonic area while the child breathes normally and then while the child takes a deep breath. Splitting is normally more easily detected after a deep breath. The splitting returns to a single sound with regular breathing. If splitting does not vary with respiration, it is called fixed splitting. This is an abnormal finding associated with an atrial septal defect.

Third Heart Sound

A third heart sound, S3, is occasionally heard in children as a normal finding. S3 is caused when blood rushes through the mitral valve and splashes into the left ventricle. It is heard in diastole, just after S2. It is distinguished from a split S2 because it is louder in the mitral area than in the pulmonic area.

Occasionally, abnormal heart sounds are auscultated. These sounds are produced by blood passing through a defective valve, great vessel, or other heart structure. To hear murmurs in children takes practice. Often, murmurs must be very loud to be detected. For softer murmurs, normal heart sounds must be distinguished before an extra sound is recognized. Once a murmur is detected, define the characteristics of the extra sound.

DIAGNOSIS

Cyanotic or acyanotic/congenital or acquired heart disease L-R/Regurgitation/stenotic, increased/decreased pulmonary blood flow in CCF/not in CCF/with or without features of infective endocarditis with grade PEM.

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This book *Exercise the Art Pediatrics Diagnosis through Systematic Clinical Survey* is an adequate bridge for the clinical assortment of pediatric cases. It's a template for the vast clinical presentation of various systems and, therefore, shall provide the reader a systematic outlook.



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In his decade of association with IAP, he held various executive positions in the Twin cities body, State and central IAP and pioneered the art of tackling the difficulties in child care. He is well-known for his contribution in advancing the spirit of excellence in the subjects. He brought laurels to the branch and the state. He carries with him the cult of continuing pediatric education through conduct of various scientific sessions. He was awarded the FIAP in recognition of extensive service rendered. He has numerous paper presentations and is recipient of gold medals for his expansive academic excellences. He has authored chapters in few textbooks and published his study in indexed journal. His areas of interests are wide and his association with his teachers, seniors, students and friends fetched him the abode of humanity. As the chief organizing secretary for APCPPEDICON 2016, he and his team have stretched the genre to the neighboring Asian countries.

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