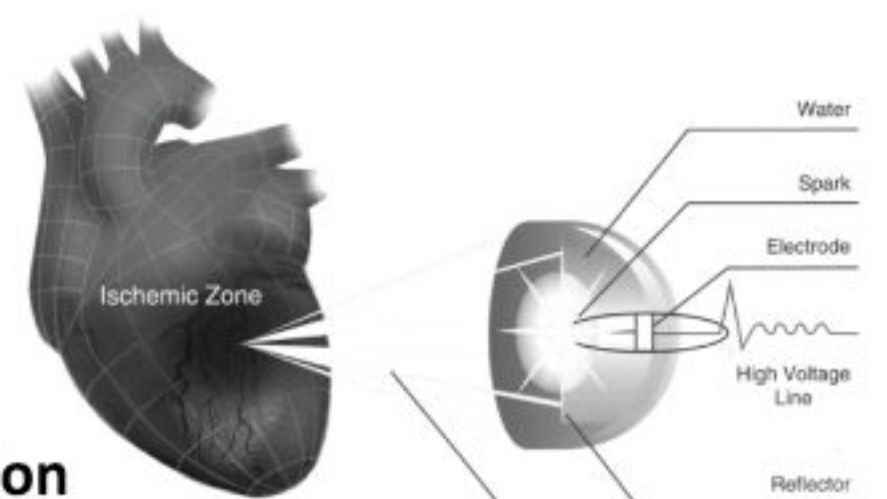




First time in Bangladesh

# ESMR

Extracorporeal Shockwave Myocardial Revascularization



Why Use Shockwaves in Cardiology

**What are Shockwaves:** Shockwaves are acoustic waves, similar to ultra-sound waves, that are generated by an underwater high-voltage spark. Shockwaves are single pulse waves with high-pressure amplitude, small pulse width and a short rise time. Shockwaves are delivered non-invasively, focused by a special ellipsoid reflector. The reflector is coupled to the patient's skin near the affected area with a water cushion. The focal zone distance into the patient's body is adjusted according to the clinical requirements.

**What is ESMR:** • Non invasive • Ultra sound guided • R-wave E.C.G. gated ESMR therapy is a new non-invasive therapy approach using Extracorporeal Shockwave technology for Myocardial Revascularization. Ischemic myocardial areas no longer accessible by conventional revascularization therapies could be treated with the Cardiospec ESMR therapy to relieve symptoms resulted from the myocardial ischemia. The treatment is performed using a Shockwave generator that is designed to address the unique clinical-anatomical requirements of the chest cavity. A cardiac ultrasound imaging system is used to locate the treatment area and to map the exact position and extent of the ischemic zone. Shockwaves are then delivered via the anatomical acoustic window to the treatment area under E.C.G. R-wave gating. Several treatment sessions are required to obtain optimal results.

**Why ESMR:** Patients with advanced CAD frequently have recurrent Angina. Surgical and interventional options for these patients typically have been exhausted or will result in only partial revascularization. ESMR offers new hope for these patients and provides therapy which complement existing treatment procedures.

**Possible Mechanisms of Action:** Although the precise mechanisms remain to be elucidated, two major physiological effects includes 1. Short term effect - Local vasodilatation 2. Long term effect - Angiogenesis i.e. the induction of neovascularization in the treated tissue. It has been described that SW may induce tissue cavitation<sup>12</sup>, generating highly localized physical forces that could produce localized stress on cell membranes. This would lead to a variety of biochemical effects, including: shear stress on cell membranes<sup>13</sup>, hyperpolarization and RAS activation<sup>14</sup>, an increase in nitric oxide synthesis<sup>15-18</sup>, an upregulation of VEGF, its receptor Flt-1 and PGF1019-22 in addition to an enhance expression of stromal-derived factor-123. Another potential cellular mechanism may involve the recruitment of progenitor cells to the site of the ischemia undergoing CSWT<sup>23-25</sup>. Thus, we can conclude that there are probably multiples angiogenic pathways involved in the beneficial effects of CSWT (Fig-2,3).

**Why ESMR:** There are patients who remained severely disabled due to myocardial ischemia related symptom and current revascularization therapy for these patient are limited, mostly highly invasive. Also treatment for patients who no longer benefit from current revascularization method due to - 1. Large number of occluded small arteries (<2 mm) that supply a myocardial area (micro-vessels disease) 2. Occlusions in a small artery (< 2.5 mm) that cannot be treated with Anti Angina medication, CABG or Angioplasty 3. Chronic Total Occlusion (CTO) in one major coronary artery So in these cases ESMR may be an option

• 3-5 ischemic zones • 100 shocks per zone • 4,500 shock Total treatment time (entire protocol) - 4.5 hours Shockwave Treatment Strategy Several treatment sessions are required. At each treatment session • shock waves should be delivered • to the border of the ischemic area • triggering the viable tissue for angiogenesis V1--1- Other cardiac indications • Chronic Heart Failure (CHF) • Post MI (Remodeling) Post PCI / CABG (Reperfusion Injury) • Post PCI (Persistent ST Elevation) • Silent Ischemia / Hibernation Shockwave Technology Shockwave Treatment Design • The patient should undergo imaging tests to locate the ischemic zone (SPECT, PET, MRI) (Fig-4) If not applicable, the treatment zone can be located using standard stress echocardiography (Fig-4)

Improvements occurs in the following parameters: • CCS class score • Exercise tolerance time • Angina threshold at exertion • Myocardial perfusion shown by SPECT • Myocardial contractility shown by stress echo. • Enhancement of coronary collaterals shown by CAG in animal model (Fig-6) • Quality of life shown by SAQ

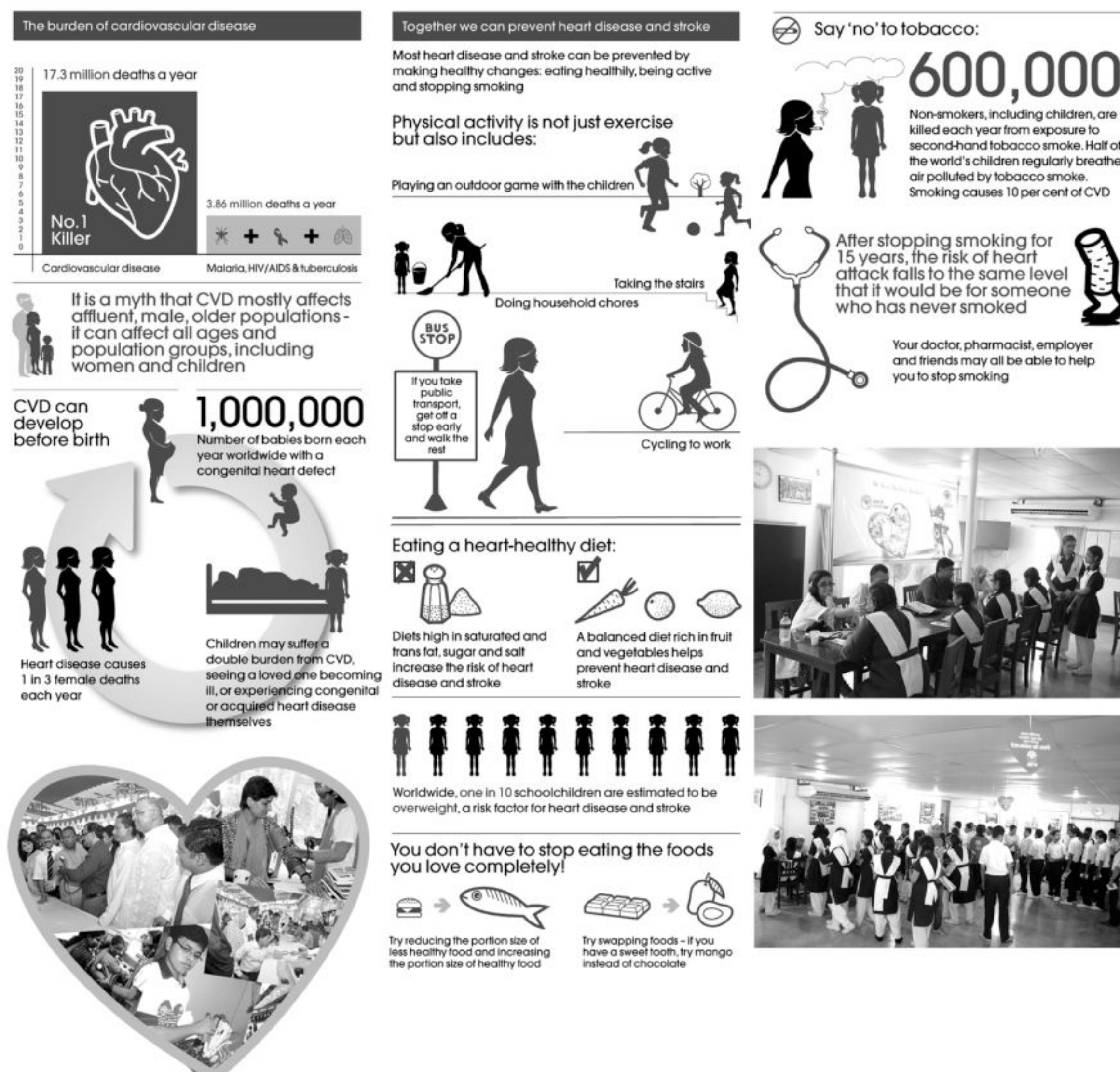
Adverse Effects Evaluation: • 24 hrs Holter monitoring: no arrhythmia • CK-MB: no myocardial damage • Haemodynamic variable: No cardiac instability.



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আমি সুপারহাট  
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Women, children and heart disease: ACT NOW to protect the hearts of those you love Cardiovascular disease (CVD), including heart disease and stroke, takes lives prematurely. Contrary to common belief, women are affected equally to men, and children are vulnerable too. Most deaths caused by CVD are preventable. Individuals, families, communities and governments must work together to avoid the physical, emotional and financial burden caused by CVD. Immediate action is required to ensure a heart-healthy future for all: encourage healthy eating and physical activity, and ban tobacco use. The burden of cardiovascular disease It is a myth that CVD mostly affects affluent, male, older populations -it can affect all ages and population groups, including women and children.



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